15 Cents AUGUST 1906 $1.00 a Year

PUBLIC LIBRARY
CITY OF DETROIT

THE FOUNDRY

THE PENTON
PUBLISHING COMPANY.

Cleveland New York Chicago Pittsburg
Boston Philadelphia Cincinnati Duluth

EVERYTHING YOU NEED IN YOUR FOUNDRY

OBERMAYER'S

PEERLESS MOLDERS' SHOVEL

ONE PIECE SOLID STEEL SHOVELS

THE BLADE AND STRAPS

are made from this One Solid Piece of Steel,

WITHOUT WELD OR RIVET

constituting the highest and most desirable form known to the art of shovel-making, and producing what has long been sought after,

A PERFECT PLAIN BACK TOOL.

Our method of rolling is such that we produce a Shovel

WITH THICK CENTER,

graduating towards the edges and point, which compensates for the wearing away of the back of the Shovel when used, the Tool retaining its perfect shape until completely worn out. Every Shovel is

CAREFULLY TEMPERED

thereby differing substantially from any other make of similar Tools. We sold during the past year a HALF MILLION of our Patented Shovels, which is the best evidence of their merit and worth that we can offer.

PRICE $4.50 PER DOZEN

NET, F. O. B. CINCINNATI, PITTSBURG, CHICAGO

The S. Obermayer Co.

CINCINNATI PITTSBURG CHICAGO

GLUETRIN
A LIQUID ADHESIVE
CORE SAND BINDER

¶ Will make better cores for you than any other material and—more too—is much cheaper and much better for all purposes where the foundry uses molasses.

¶ Sold in tank cars or barrels---the latter containing from 50 to 53 gallons each.

¶ Our stencilled brand and weights are a guarantee of the quality and of the quantity on the basis of the exact weight---10½ pounds to each gallon.

ROBESON PROCESS CO.

CAMDEN, N. J., U. S. A.

¶ GLUETRIN or ESSO CORE BINDER is carried in stock and sold by *The S. OBERMAYER COMPANY* from their houses in *Cincinnati, Chicago, Pittsburg, St. Louis, New York,* and in Canada by *The HAMILTON FACING MILL CO., Ltd., Ontario*

Any reliable dealer can furnish it to you.

PULLEY MOLDING MACHINES

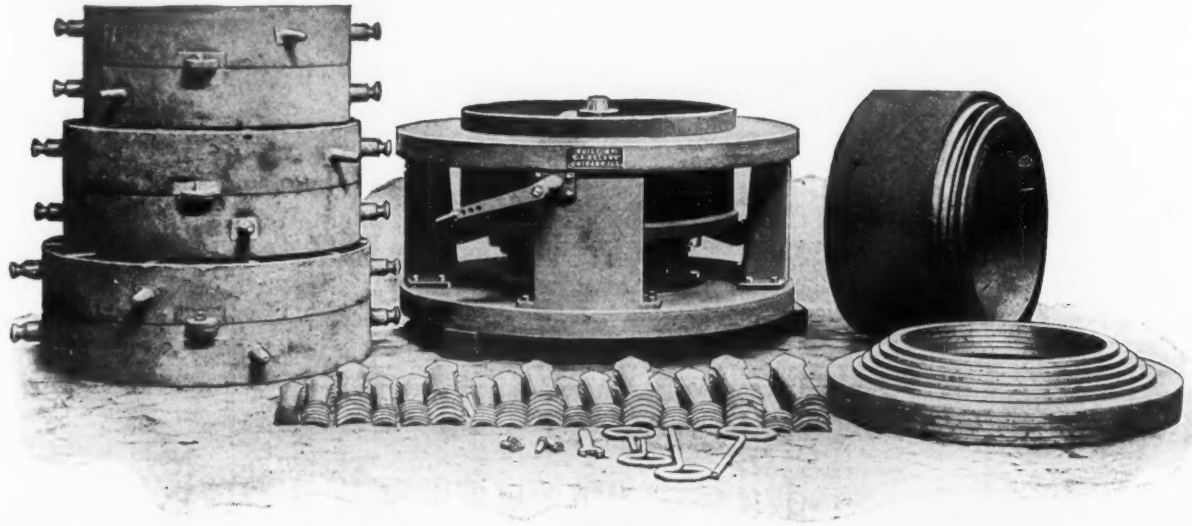


FIG. 428.

Agents for THE DELANO Machine, which during the past twenty-five years have become so well known that they need no introduction from us. CORRESPONDENCE SOLICITED.

Molding Machines for Every Class of Work

PNEUMATIC OR HAND RAMMED

J. W. Paxson Co., - Philadelphia, Pa.

J. W. Paxson Co.

SAND SIFTERS

We Manufacture Several Varieties

HAND POWER TIGHT AND LOOSE PULLEY

TRIPOD AND SQUARE PNEUMATIC TYPES

Plumbago and Mineral Leads

FROM OUR

QUAKER CITY MILLS

Have not deteriorated in Quality During the past fifty years of their manufacture.

"There are none any better, and few as good."

PHILADELPHIA, PA.

The Paxson-Colliau Cupola

The more you examine it, the better you will like it

—

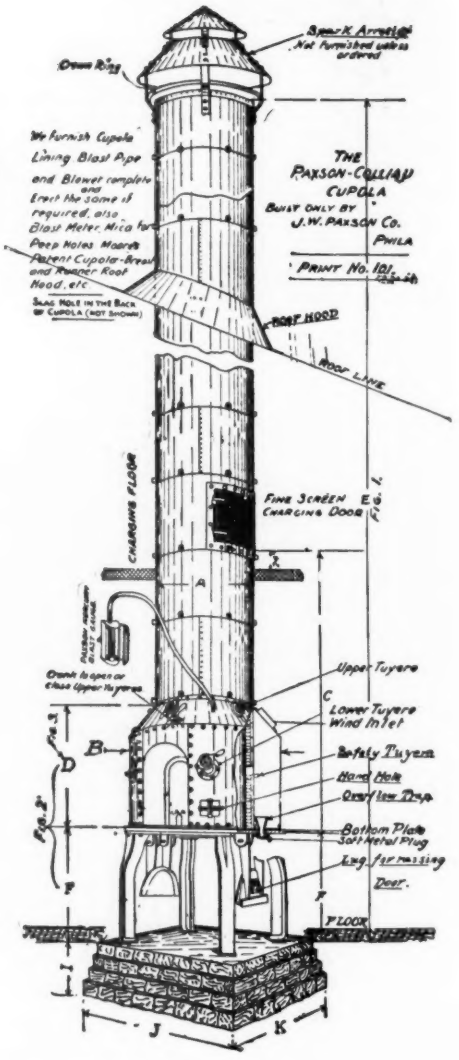
The Acme of Science in Cupola Construction

—

All that was Best in the old Colliau Cupola, with every improvement suggested by long experience added.

—

Location and area of tuyeres insure the highest melting efficiency



The Paxson-Warren

SAND BLAST

MACHINERY

IN USE EVERYWHERE

J. W. PAXSON COMPANY

PHILADELPHIA, PA.

Our Reputation Founded on Merit=Not Age.

Cheapness is not economy when it comes to buying Plumbago.

The best is none too good.

The reputation of our Pure East India Plumbago is built upon true merit—a trial will convince you of the truth of our statement.

We manufacture other goods in the foundry line—Stove Plate Facings, Rhode Island Facings, Heavy Machine Facings, Soapstone, Talc, Sea Coal, Core Wash, Foundry Supplies and Equipment—all of an exceptional quality and sold on an unconditional guarantee.

THE HILL & GRIFFITH COMPANY

WRITE US.
Our catalog No. 5 for the asking

CINCINNATI, OHIO

Classified Index
FOR
FOUNDRY BUYERS

Air Compressors
The J. D. Smith Fdry. Supply Co.

Brass Facing
The J. D. Smith Fdry. Supply Co.

Brass Melting Furnaces
The J. D. Smith Fdry. Supply Co.

Cranes
The J. D. Smith Fdry. Supply Co.

Core Ovens
The J. D. Smith Fdry. Supply Co.

Core Machines
The J. D. Smith Fdry. Supply Co.

Chaplets
The J. D. Smith Fdry. Supply Co.

Crucibles
The J. D. Smith Fdry. Supply Co.

Core Compound
The J. D. Smith Fdry. Supply Co.

Charcoal
The J. D. Smith Fdry. Supply Co.

Cupolas
The J. D. Smith Fdry. Supply Co.

Flour
The J. D. Smith Fdry. Supply Co.

Facings
The J. D. Smith Fdry. Supply Co.

Foundry Elevators
The J. D. Smith Fdry. Supply Co.

Linseed Oil
The J. D. Smith Fdry. Supply Co.

Ladles
The J. D. Smith Fdry. Supply Co.

Molders' Tools
The J. D. Smith Fdry. Supply Co.

Metal Saws
The J. D. Smith Fdry. Supply Co.

Molding Sand
The J. D. Smith Fdry. Supply Co.

Molding Machines
The J. D. Smith Fdry. Supply Co.

Metallic Fillers
The J. D. Smith Fdry. Supply Co.

Magnetic Separators
The J. D. Smith Fdry. Supply Co.

Plumbago
The J. D. Smith Fdry. Supply Co.

Pressure Blowers
The J. D. Smith Fdry. Supply Co.

Pneumatic Hammers
The J. D. Smith Fdry. Supply Co.

Rammers
The J. D. Smith Fdry. Supply Co.

Silica Wash
The J. D. Smith Fdry. Supply Co.

Soft Brushes
The J. D. Smith Fdry. Supply Co.

Stove Plate Facing.
The J. D. Smith Fdry. Supply Co.

Sand Sifters
The J. D. Smith Fdry. Supply Co.

Shovels
The J. D. Smith Fdry. Supply Co.

Sand Blast
The J. D. Smith Fdry. Supply Co.

Soapstone Facing
The J. D. Smith Fdry. Supply Co.

Snap Flasks
The J. D. Smith Fdry. Supply Co.

Sprue Cutters
The J. D. Smith Fdry. Supply Co.

Talc
The J. D. Smith Fdry. Supply Co.

Tumbling Barrels
The J. D. Smith Fdry. Supply Co.

Trolley Track
The J. D. Smith Fdry. Supply Co.

Wire Brushes
The J. D. Smith Fdry. Supply Co.

Wire Straighteners
The J. D. Smith Fdry. Supply Co.

CLEVELAND, OHIO

FIGURES TALK 100% BENEFIT

W. C. HAVENS, PRES. J. L. WERTS, VICE-PRES. J. HERBERT GALLAGHER, TREAS. J. BAYARD HENDRICKSON, SEC'Y.

Neptune Meter Co.

JACKSON AVE. & CRANE STREET
BOROUGH OF QUEENS
NEW YORK

BRANCH OFFICES
CHICAGO, 84 TO 90 S. CANAL ST. TELEPHONE 979 MAIN
BOSTON, 85 OLIVER ST. TELEPHONE 645 BROOKLINE
ATLANTA, 12 EQUITABLE BLD.
SAN FRANCISCO, 312 MARKET ST.

MANUFACTURERS OF THE
Trident Water Meters
CABLE ADDRESS: "TRIDMETOO."
TELEPHONE
960 & 961 GREENPOINT

Long Island City, N.Y. May 3rd 190 6

Thomas W. Pangborn Company,
227-229 Fulton Street,
New York City, N.Y.

Gentlemen:-

Referring to the #1 "AMERICAN-DIAMOND" Sand Blast sold us some two weeks ago, it gives us pleasure to recommend the outfit for its simplicity and efficiency.

We have found the results and consequent saving far greater than anticipated, as we have reduced the cost of cleaning castings to a very considerable degree, and what is more important, have improved their appearance at least 100%, also the surface conditions for machinery are very much improved.

The fact that we expect to order one or two more of the machines in the near future should speak for itself, for you have not only accomplished all the results promised, but what is contrary to the usual outcome of such tests, have done much better than you agreed or we expected.

Yours truly,
Neptune Meter Company.
Ernest E. Sammis Supt.

MORE SUCH CONVINCING TESTIMONY WILL APPEAR IN EACH ISSUE

WATCH THIS PAGE

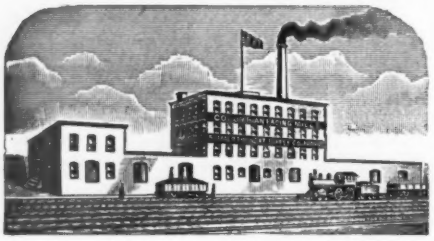
T. W. Pangborn Co.

227-229 Fulton Street

NEW YORK U. S. A

Buffalo Foundry Supply Co.

BUFFALO, NEW YORK



Sole manufacturers of

Columbia Dry Sand and Loam Facing

Also manufacture many other kinds, such as

COLUMBIA CAR WHEEL FACING

COLUMBIA HEAVY STOVE PLATE FACING

COLUMBIA CORE WASH **COLUMBIA RETURN FACING**

COLUMBIA FIRE-PROOF FACING **COLUMBIA INGOT MOLD FACING**

As well as many others of our SPECIAL FACINGS, and of course we have

SEACOAL FACING

COLUMBIA CORE COMPOUND

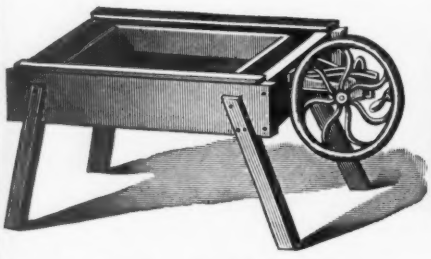
FOUNDRY SUPPLIES

of all kinds

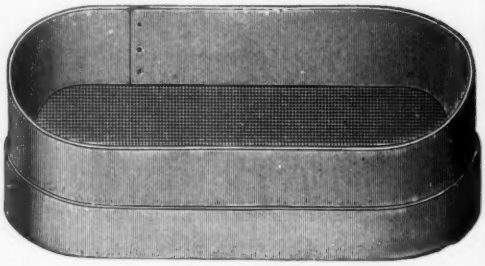
ALBANY MOLDING SAND

of all grades—

0-1-1½-2-2½-3-3½-4



Portable Foundry Sifting Machine



The Kingsland Oval Snap Flask Riddle

WHEN WRITING KINDLY MENTION "THE FOUNDRY"

SAND MIXERS

If you are still mixing by hand or dissatisfied with your present method, write us.

We manufacture a continuous Mixer.

J. S. McCormick Co.

Foundry Supply Depot

PITTSBURG, PA.

PRIDMORE
MOLDING
MACHINES

ARE MADE IN
17 DIFFERENT TYPES
400 DIFFERENT SIZES.

HENRY E. PRIDMORE,
CHICAGO, ILL.

PRIDMORE

MOLDING

MACHINES

HAVE NO EQUAL.

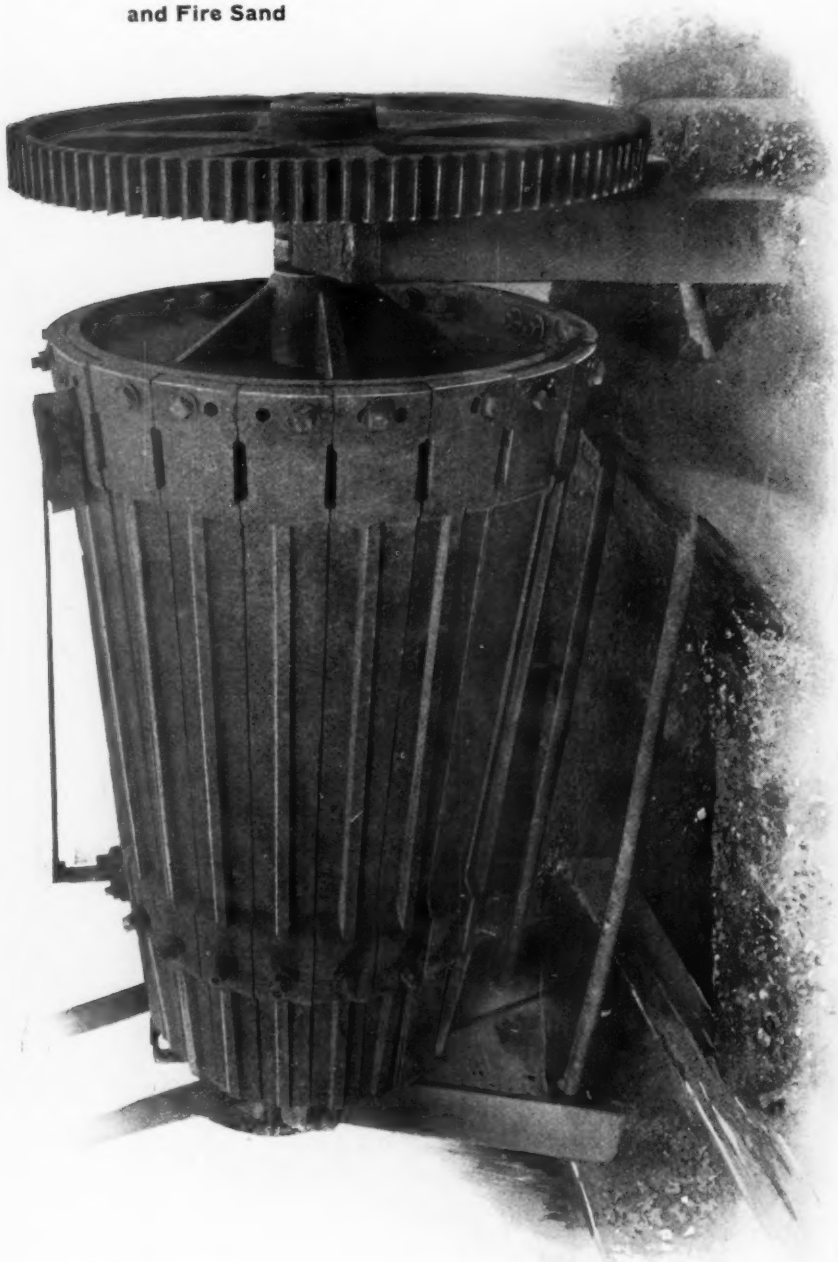
MORE SOLD THAN ALL
OTHER MAKES COMBINED.

HENRY E. PRIDMORE,

CHICAGO, ILL.

PRINCE CONOIDAL SAND MILL

For Core Sand, Facing Sand and Fire Sand



Capacity 40,000 lbs. Core Sand or Facing in 9 Hours=3 Men.

Makes Perfectly Mixed (milled) Oil Mixture for Cores. 90 Sand to 1 Oil—Uses 5 H. P. at Full Capacity.

Sand for All International Steam Pump Cores at Harrison, N. J., is Prepared by this Mill.

Manufactured by

THE E. H. MUMFORD COMPANY

17th and Callowhill Sts., PHILADELPHIA, PA.

Jackman Co.
Caxton House,
Westminster, London

John A. Rathbone
44 Buhl Block
Detroit, Mich.

W. R. Colcord Machinery Co.
St. Louis, Mo.

Every Time

YOU

Make a Half Mould

WE

Make a Whole One

A Mould

A Minute

FROM

ONE MAN.

The Latest

Development

in Moulding

Machinery

½ the Sand

★

½ the Flasks

★

⅛ the Floor Space

★

⅙ the Labor

★

NO ROLLING OVER

Rathbone Multiple Moulding Machinery

JOHN A. RATHBONE,
44 BUHL BLOCK
DETROIT

THE E. H. MUMFORD CO.,
PHILADELPHIA, PENN.

TABOR MACHINES

Power Ramming Split Pattern Machines

Hand Ramming Split Pattern Machines

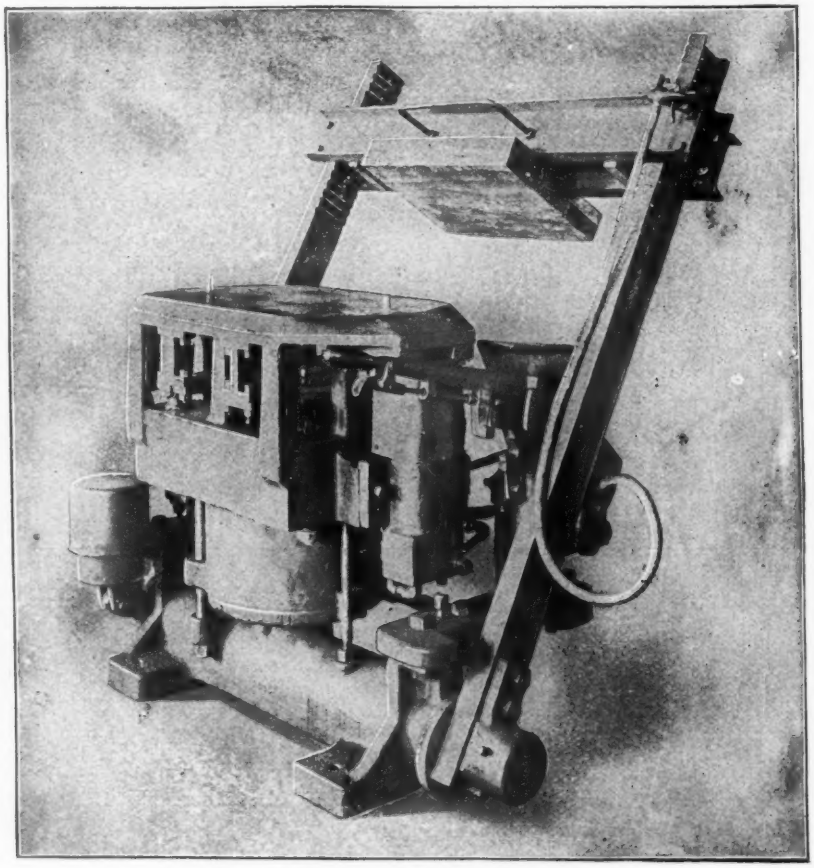
Power Ramming Stripping Plate Machines

Hand Ramming Stripping Plate Machines

Power Ramming Vibrator Frame Machines

Hand Ramming Vibrator Frame Machines

Power Ramming "Squeezers"



POWER RAMMING SPLIT PATTERN MACHINE WITH 4″ STRAIGHT DRAFT.

The Tabor Manufacturing Company

18th and Hamilton Streets, Philadelphia, Pa.

Chicago Office
28 So. Canal Street.

Fenwick Freres
Paris

John Macdonald & Son
York St., Glasgow, Scotland.

TABOR

Molding Machines

Represent all that is best and up-to-date in successful foundry practice

BUILT TO DELIVER THE GOODS

SPEED

ACCURACY

DURABILITY

CAN YOU AFFORD TO BE WITHOUT THEM?

Our experience of 20 years is at your command
We shall be pleased to correspond with you

The Tabor Manufacturing Company

18th and Hamilton Sts.
PHILADELPHIA, PA.

CHICAGO OFFICE
28 S. Canal St.

Fenwick Freres
Paris, France

ENGLISH REPRESENTATIVES
John Macdonald & Son, Glasgow, Scotland

MACPHAIL MOLDING MACHINES

FOR

DIFFICULT DRAGS

USE OUR

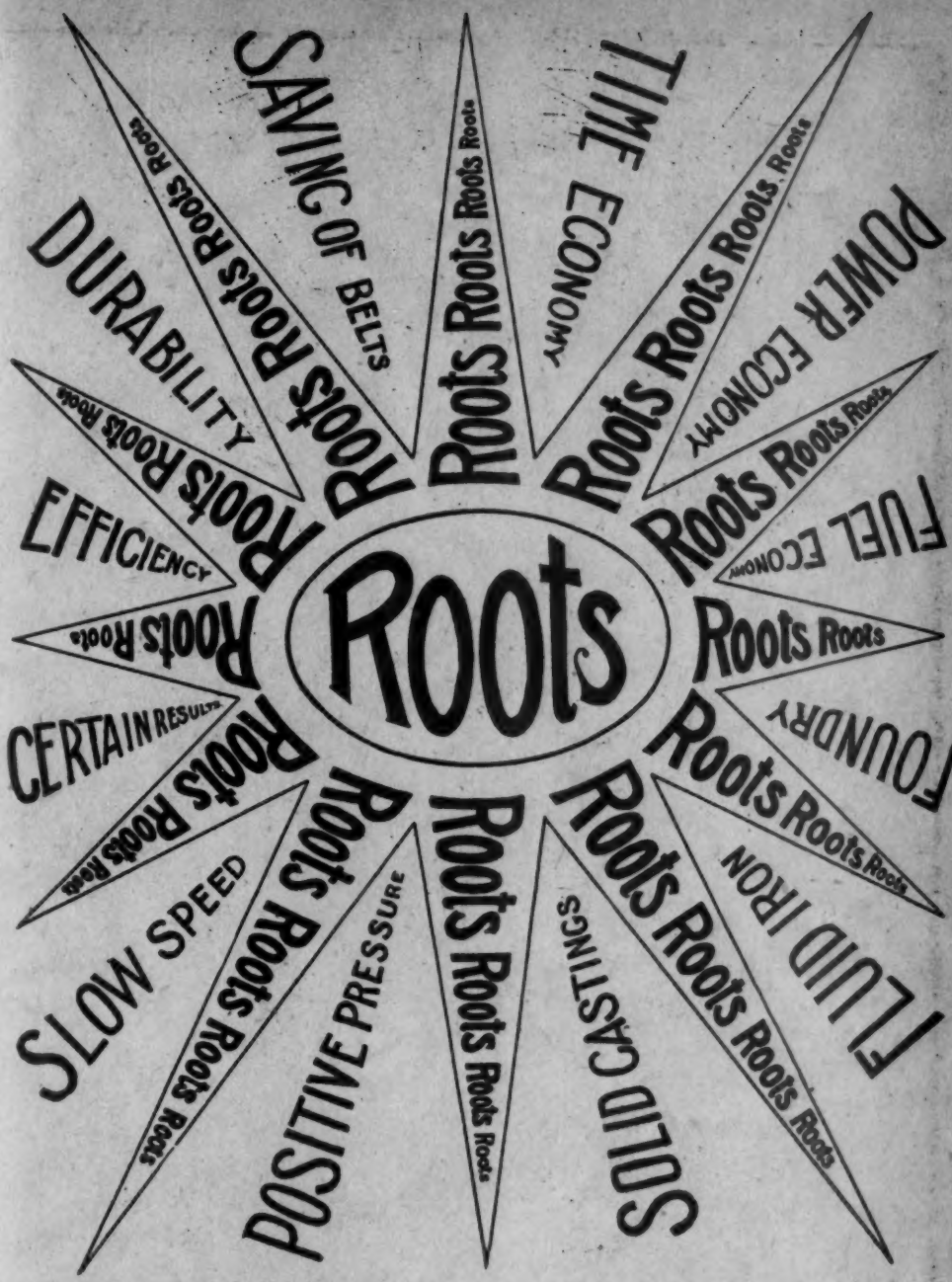
AUTOMATIC STRIPPING

ROCKOVER

SEND PRINT FOR ESTIMATE

THE MACPHAIL MOLDING MACHINE CO.

DAVENPORT, IOWA



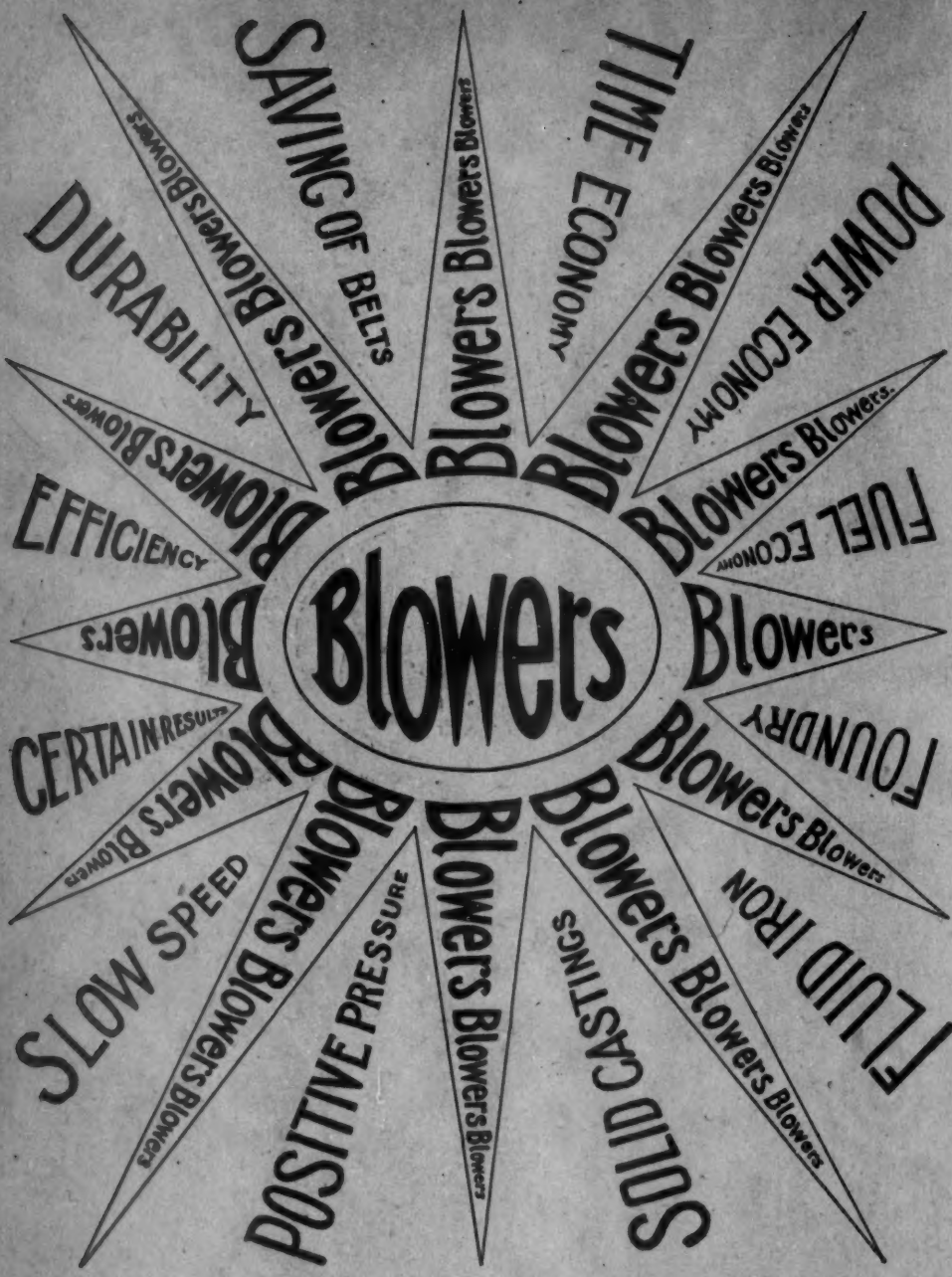
P. H. & F. M. ROOTS CO.

Home Office

CONNERSVILLE, INDIANA.

CHICAGO OFFICE
1547 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty St.



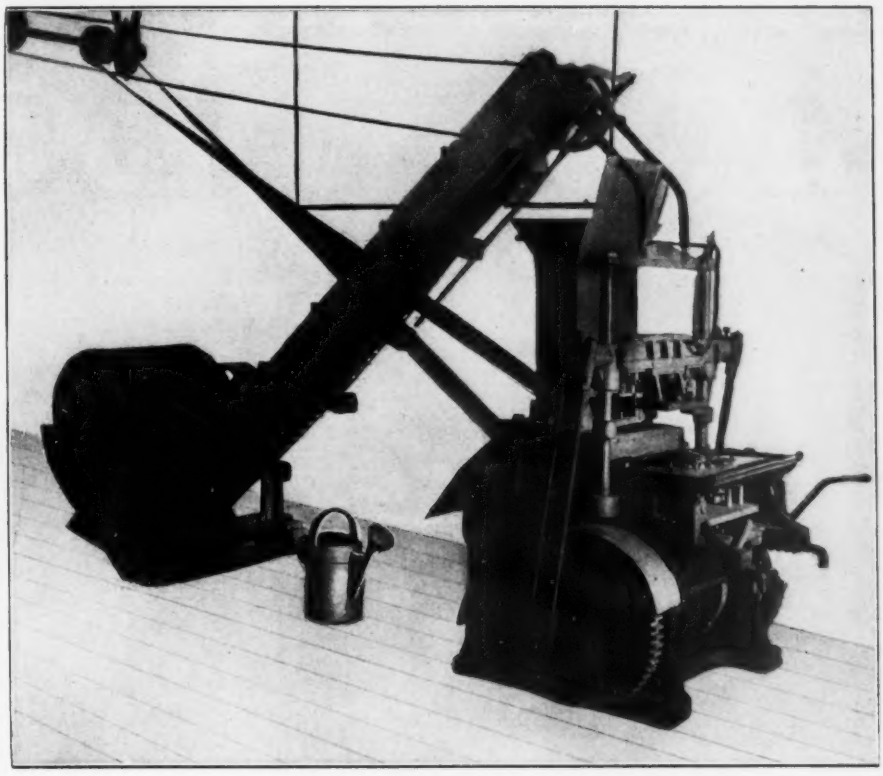
P. H. & F. M. ROOTS CO.

Home Office

CONNERSVILLE, INDIANA.

CHICAGO OFFICE
1547 Marquette Bldg.

NEW YORK OFFICE
120-122 Liberty St.



THE BERKSHIRE

Showing our size A machine, taking a flask up to 14 in. x 22 in., as set up and ready for work in the foundry, with sand conveyor and rotary riddle in position.

The Berkshire Mfg. Co.

CLEVELAND, OHIO

MOLDING MACHINES

SEND FOR CATALOGUE NO. 9.

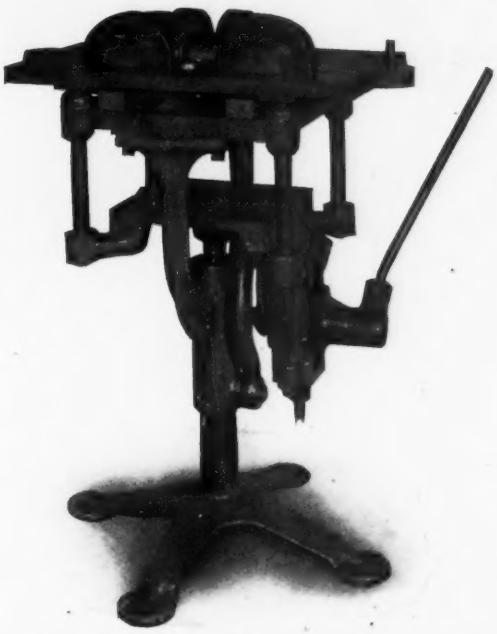
Over 8000 of our machines in use.

The Adams Company

DUBUQUE, IOWA, U. S. A.

J. W. Jackman & Co., London, S. W. England
H. Glaenzer & Perreaud, Paris, France
V. Lowener, Copenhagen, Denmark
Ing. G. Pontremoli & Co., Milan, Italy

Maywood Molding Machines



Are simplest, most durable, adapted to greater variety of styles and sizes of castings; patterns can be changed in one-tenth time required on other makes; no jarring sand from molds in drawing patterns; no expensive installation of air compressors, piping, special motors, belting or machinery required, and with the same amount of labor will produce more molds in a given time than expensive machines requiring such accessories. Remember, no carrying sand to machines and completed molds away. The workman moves the machine along the sand pile and sets completed molds behind him.

A set of machines will save their cost in ninety days, and continue doing so every ninety days thereafter for years. No getting out of order. No machinists needed to adjust or change patterns. Simplicity, economy, durability, and results superior to all others.

New catalogue telling why for the asking.

Maywood Foundry & Machine Co.

80 Wall Street
NEW YORK CITY

The Old and The New

MERIT MEANS PROGRESS

Where we started---Frame Building at Sharpsburg, Pa.

Where we are now---Modern Factory at Zelienople.

Herman Pneumatic Machine Co.

(Successors to Chas. Herman & Son)

ZELIENOPLE, PA.

B. & O. and B. R. & P. Railroad Connections.

275 Molds in 7 Hours

¶ Every day operators in our foundry are turning out 275 molds with the Modern Molding Machine.

¶ Before we made this machine we had hard work to get skilled molders, using "squeezers" to turn out 120 molds of the same job.

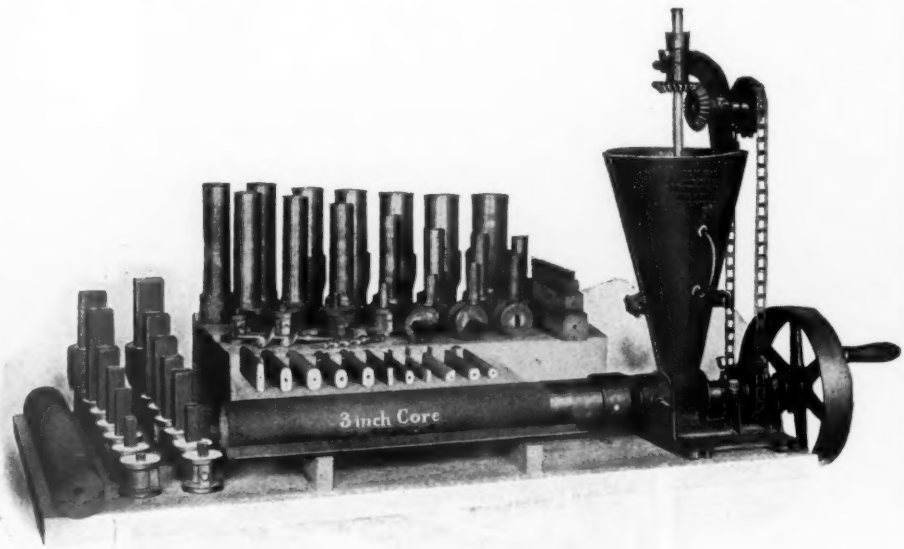
¶ The castings are better and more uniform and we have no labor difficulties.

¶ A green hand can use the "Modern" as well as a skilled molder.

¶ If you are molding in the old way and getting 120 molds a day and your competitor is getting 275 molds, it's time to WAKE UP.

ARCADE MFG. CO. Freeport, Ill.

All Made on One Machine



THE HAMMER CORE MACHINE

(The Original Core Machine)

is now equipped to make:

Round Cores 1-4 inch to 3 inches.
Square Cores 1-4 inch to 2 inches.
Oval Cores up to 3 inches.
Irregular Shapes to 3 inches.

This machine has a greater range than any Core Machine on the market.
We guarantee our machines to give satisfaction and sell them on trial.
Over 1,000 of these machines are now in successful operation.
Our sales of Core Machines are larger than those of all other makes combined.

Write for Descriptive Catalog.

Notice to Owners of Hammer Core Machines. Those having machines equipped for round cores up to 2¼ inches can secure additional equipment for sizes between 2¼ inches and 3 inches at a nominal cost. You do not require a new machine for the larger sizes. Write for particulars.

BROWN SPECIALTY-MACHINERY COMPANY

Cor. Jackson and Clinton Sts., CHICAGO, ILL.

Thos. W. Pangborn Co., 227-229 Fulton St., New York, exclusive Sales Agents for New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and West Virginia.

Sherwin's Core Machines

PATENTED JANUARY, 1902.

Note—Working Parts Protected.

The Latest, Simplest, Strongest and Most Economical Machine on the Market.

No. 3

The most popular size. Makes cores from half inch to three inches in diameter, by hand or by power.

Cores are round, straight, smooth and vented perfectly from end to end.

Dies for Special Shapes Made to Order.

Rosin or Sharp Sand Cores Made without Flour.

Hand Wheel and Belt Pulley furnished with each.

All Dies are Perfectly Round Steel Tubes, lasting longer and giving better satisfaction than any other.

Two-inch Seven Foot Sand Core.

The Sherwin Core Machines

Were designed to meet the requirements of its inventor, who is superintendent of one of the largest and best foundries in the country.

They Have No Superior.

For Particulars and Prices Address

THE TURNER, VAUGHN & TAYLOR CO.

Cuyahoga Falls, Ohio,

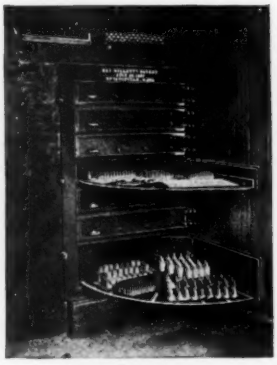
U. S. A.

When You Need a Baker

PORTABLE

Take a Look at the

Millett Core Oven



STATIONARY

Note that any of the shelves may be filled or emptied without interfering at all in the operation of the oven. The double door arrangement (exclusively Millet---and patented) protects your coremaker from the heat and smoke. The shelf is open, but the oven closed. There is no wasted heat. Again, you obtain perfectly baked cores in a fraction of time taken by other methods. The "Millett Way" is the SURE way to core-room profits.

Let us send you a list of users.

The Millett Core Oven Co.

Brightwood, Mass., U. S. A.

SALES AGENTS: S. Obermayer Co., Cincinnati and Chicago. J. W. Paxson Co., Philadelphia. J. W. Jackman & Co., London. J. S. McCormick Co., Pittsburgh, Pa., Thomas W. Pangborn Co., 227 Fulton Street, New York City.

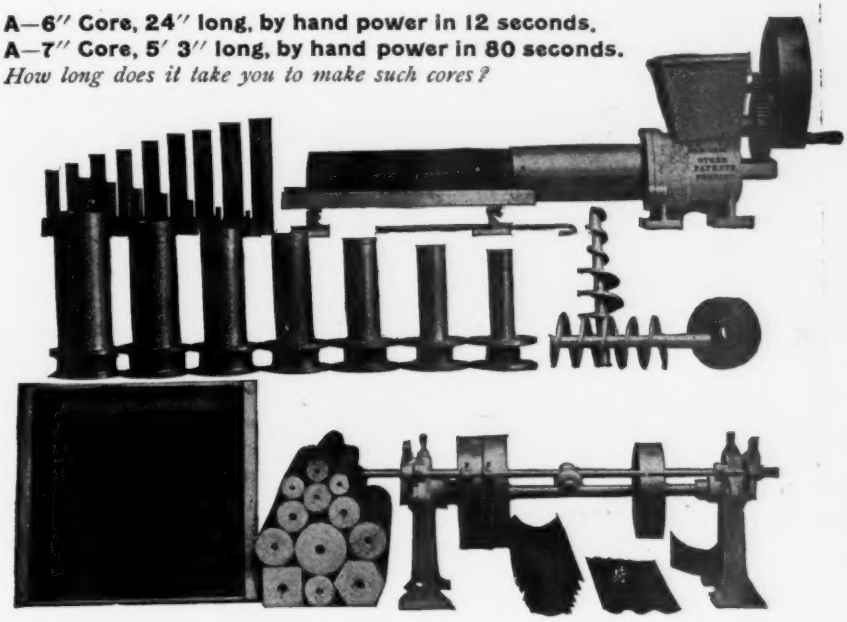
THE WADSWORTH

IMPROVED

Core Machines for every need

Hand, Belt, Air, Steam or Electric Driven.
Round cores from 3/8" to 7"
Also irregular shapes.

A—6″ Core, 24″ long, by hand power in 12 seconds.
A—7″ Core, 5′ 3″ long, by hand power in 80 seconds.
How long does it take you to make such cores?



The wide range of shapes, the great strength and accuracy of cores made on our machines make them the best possible investment for your foundry.

Write for prices and descriptive catalogue.

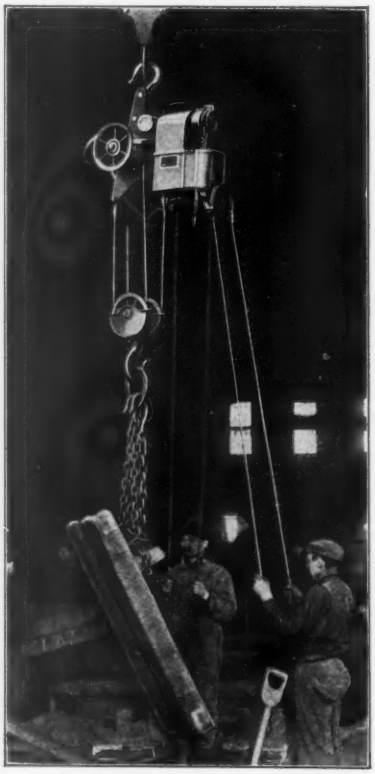
The Falls Rivet & Machine Co.

Cuyahoga Falls, Ohio, U. S. A.

FOREIGN AGENTS:

J. W. Jackman, London, England. **Franz Kustner, Dresden, Germany.**
The Hamilton Facing Mill Co., Ltd., Hamilton, Ont., and Montreal, Que.

The Cost of Foundry Lifting



If you figure current at 10c per kilowatt hour, (which is a high rate—6c per kilowatt hour would be closer the average figure), a Yale & Towne Electric Hoist with one cent's worth of current will lift a ton 33 feet.

The foundry controller is graduated to five speeds so that the hook can be eased to the fraction of an inch. This enables cores to be lifted rapidly without the least damage to the mould while the next minute a casting weighing tons may be picked up and taken to the cleaning room.

This hoist is almost as portable as a TRIPLEX CHAIN BLOCK. It is simple to install and operate, and all parts are easy of access, but carefully enclosed against dust, heat and moisture.

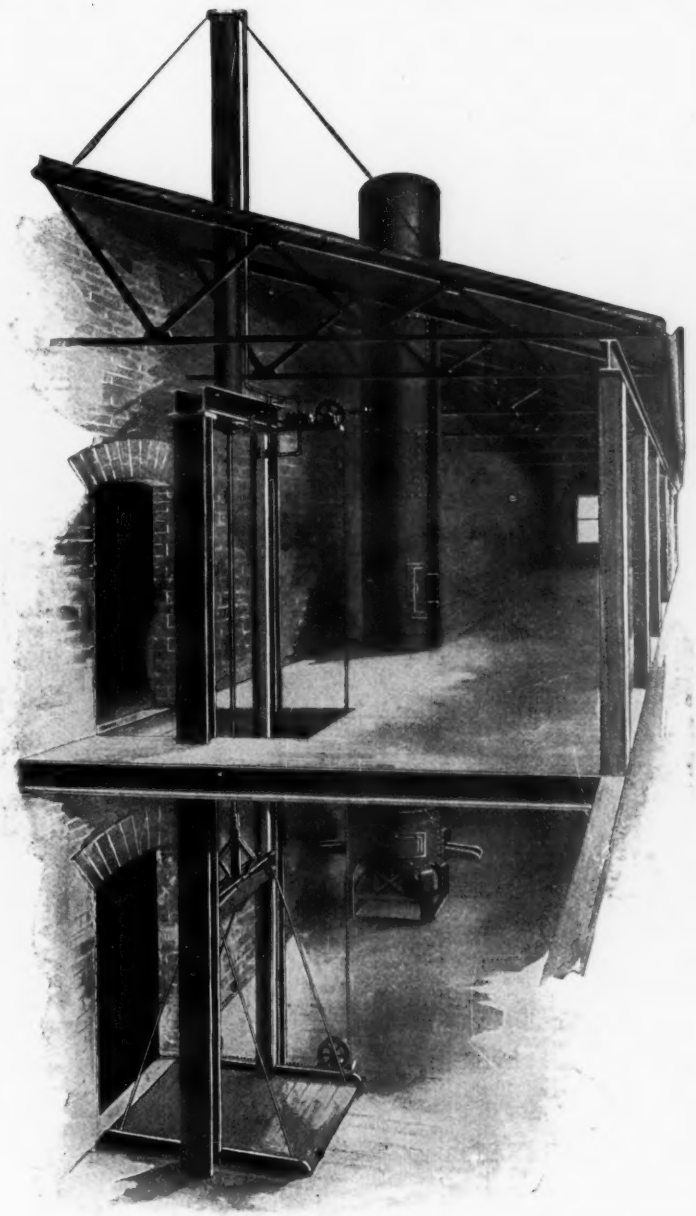
Our catalog pictures some foundry installations.
Write for it.

The Yale & Towne Manufacturing Company

9 Murray St. New York.

EUROPEAN WAREHOUSES—Fairbanks Co., London and Hamburg; Fenwick Freres & Co., Paris; Alfred H. Schütte, Köln a Rh.

Pneumatic Foundry Elevators



CURTIS & CO. MANUFACTURING CO.

ST. LOUIS, MO.

Costs Nothing to Run It

Don't believe it, of course. Folks never do at first.

Seems too good to be true. "A hydraulic elevator that costs nothing to run,—bosh !"

"Why, Ridgway, don't you know if what you say was true everybody would be getting your elevator?"

Well, they are, aren't they?

That is, everybody but you are getting them, and the chances are 99 to 100 that you will have them, too—after a while.

One thing sure. You cannot be deceived, since we supply the elevators without one cent of payment, and you do not pay for them until you get them going in your works and see for yourself they are all we say they are.

If they fail to come to promises even in the slightest all you have to do is to set the machines on the cars and send them back to Coatesville.

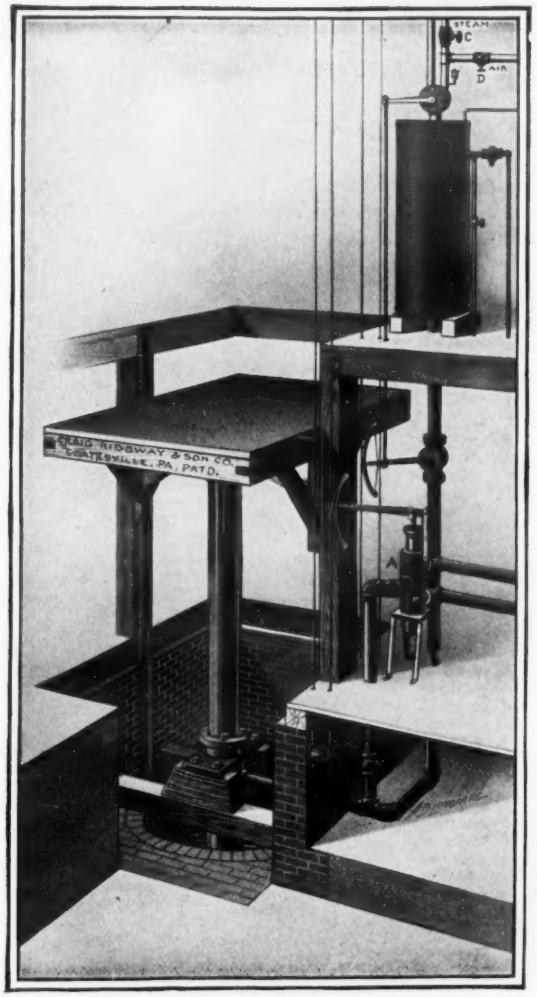
The Steam Hydraulic is surely a most wonderful thing, and we don't blame you one bit for not crediting it—but you are a poor stick of an engineer if you don't investigate what it means to

HOOK 'ER TO THE BILER

Craig Ridgway & Son Co.

COATESVILLE, PA.

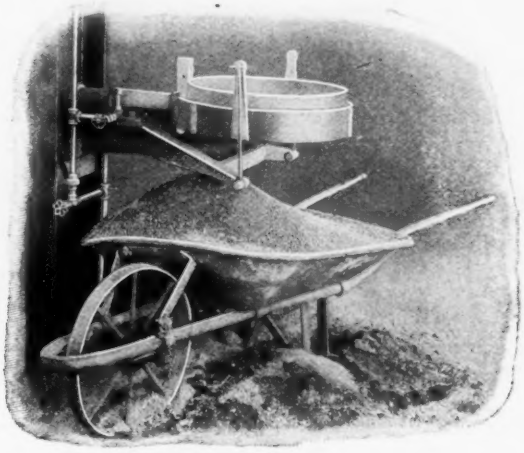
European Agents: CHAS. G. ECKSTEIN,
Kaiser Wilhelmstr. 49, BERLIN, GERMANY



Hanna Shakers

for General Use

NO FOUNDRY COMPLETE WITHOUT ONE.



POST SHAKER FOR USE WITH WHEEL BARROW.

CONSTRUCTION

ALL OF OUR SHAKERS ARE MADE ENTIRELY of steel and iron and of such design as to give maximum strength and service with a minimum amount of air and repairs. Continued orders for additional machines is the best argument we can use as to why you should own one. Hundreds of the first ones made still in use.

Hanna Engineering Works

820 Elston Ave., CHICAGO.

Thos. W. Pangborn Co., 227 Fulton St., New York City.

Pneumatic Engineering Appliances Co. Ltd., Palace Chambers, Westminster, London, Eng.

S. Obermayer Co., Chicago, Cincinnati.

Will You Gamble Two Cents ?

Only the price of a postage stamp stands between you and a definite knowledge of the profitable utility of *Shelton Metallic Filler.*

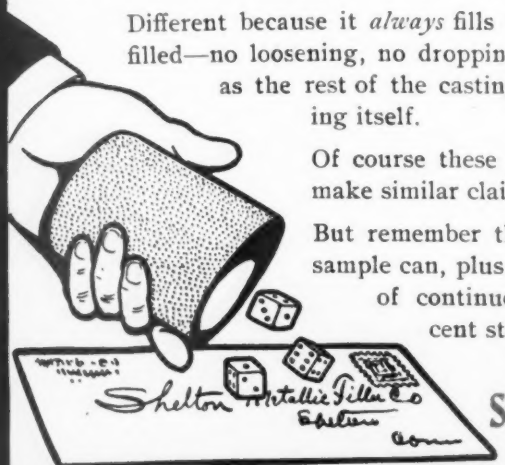
Our offer of a free sample has, within the past ten years, been instrumental in placing the best and only absolutely dependable filler in more than two thousand foundries.

Placed there to *stay*—for no sensible man is going to be without

SHELTON METALLIC FILLER

when he once finds out what it does.

We want to show *you*—we want to convince you by practical tests right in your own foundry that **Shelton Metallic Filler** is as different from other fillers as black is from white.



Different because it *always* fills sand holes and blow holes to *stay* filled—no loosening, no dropping out. It takes the same finish as the rest of the casting and becomes a part of the casting itself.

Of course these might be mere words ? ? ? others make similar claims.

But remember that we are staking the cost of a sample can, plus our business reputation and hope of continued success—all against your two-cent stamp.

The sample is absolutely free. Ask for it today.

Shelton Metallic Filler Co.
DERBY, CONN.

IN PRICE WE COMPETE

IN QUALITY WE EXCEL

Just What You Need

Don't destroy—remedy the casting. That blowhole, crack or other slight defect which unfits it for commercial use can be filled in, or covered by this "reduced iron" compound—X-CEL-ALL CEMENT. It forms part of the casting itself. Its color when hard, is that of cast iron and will withstand red heat, steam, water or oil. It can be chipped, planed or finished with a fine file or accorded any treatment given a casting, and is invaluable in steel and iron foundries. No other cement can be used in so many different ways with such perfect results. Our customers know this—from others we desire a trial order. X-CEL-ALL STEEL CEMENT is put up in 5, 10 and 25 pound cans.

Ask for free Sample.

The Shanafelt Mfg. Co.

SUCCESSORS TO THE CANTON FILLET CO.

Canton, Ohio

GET IT OF

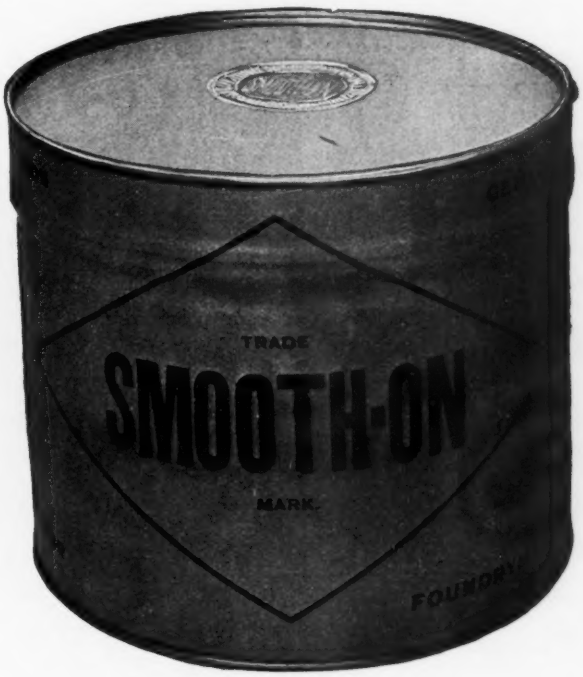
THE CLARK
CAST STEEL CEMENT
COMPANY

SHELTON, CONN.

It is the best

Use The Best

SMOOTH-ON CASTINGS, for repairing blemishes or blow holes in iron or steel castings. When hard, this cement has the same color and appearance as cast iron, and will withstand a red heat, steam, water or oil.



Our new 100-page illustrated catalogue and prices will interest you

SMOOTH-ON MFG. CO.

572-574 Communipaw Ave.

JERSEY CITY, N. J., U. S. A.

CHICAGO STOCK
61-69 N. Jefferson St.

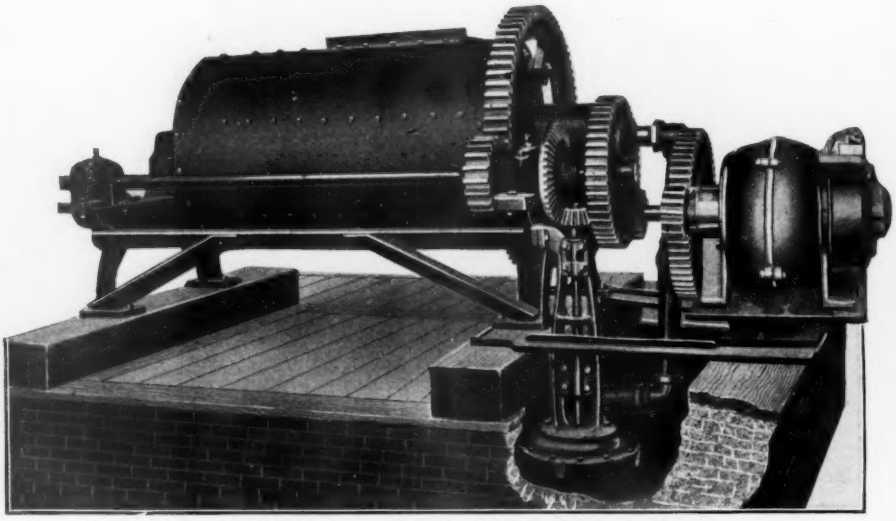
SAN FRANCISCO STOCK
T. H. Sellers & Co., 151 Steuart St.

AGENTS FOR GREAT BRITAIN

Hodgson Hartley, Ltd., Little Peter St., Knott Mill, Manchester, England

INCREASE YOUR DIVIDENDS

We know of foundries that had old Cinder heaps. They put in our patent WATER CINDER MILL, and cleared up over $5000.00 in a year's run. See if we cannot help you. See if you have not a gold mine.



The above cut is one of our Motor driven Cinder Mills.
We build both Motor and belt driven Mills.

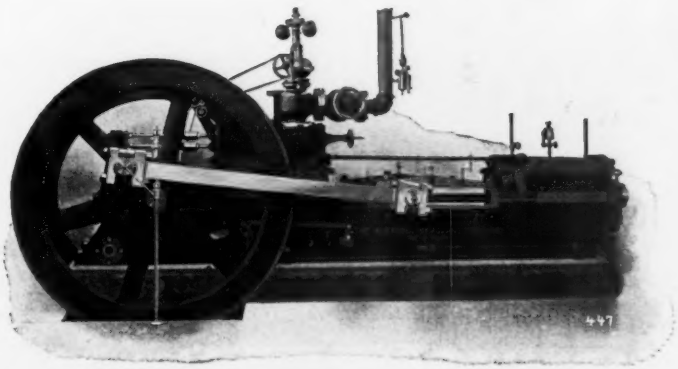
THE W. W. SLY MFG. CO.

Cleveland, O.

Manufacturers of Foundry Appliances

Send for our catalog if you have not received a copy.

STRAIGHT LINE AIR COMPRESSORS



Simple in Design, with minimum number of parts and direct, positive application of power to resistance.
Self-Contained in type, permitting the simplest foundation, with low cost of installation.
Completely Accessible in every part, permitting inspection and adjustment without the removal of any part.
Easily Managed, ensuring high class results over long periods without expert attendance.
Self-Regulating under all variations of load and operating conditions.
A Superior Type for all purposes demanding moderate capacity, good economy, great reliability and moderate cost of installation and up-keep.

PNEUMATIC TOOLS **AIR LIFTS**

INGERSOLL-RAND CO.

11 Broadway NEW YORK

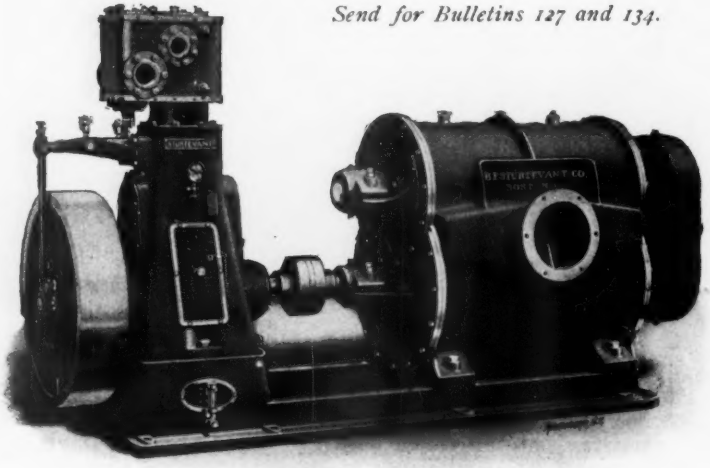
Chicago, Ill. Cleveland, O. Philadelphia, Pa. St. Louis, Mo.
El Paso, Tex. Pittsburg, Pa. Houghton, Mich. Boston, Mass.

H24

We Manufacture a Full Line

of air moving machinery for creating pressures up to 10 pounds per square inch. We are in position to advise without prejudice as to type. Our interest centres in the success of the installation.

Send for Bulletins 127 and 134.



B. F. STURTEVANT CO., Boston, Mass.

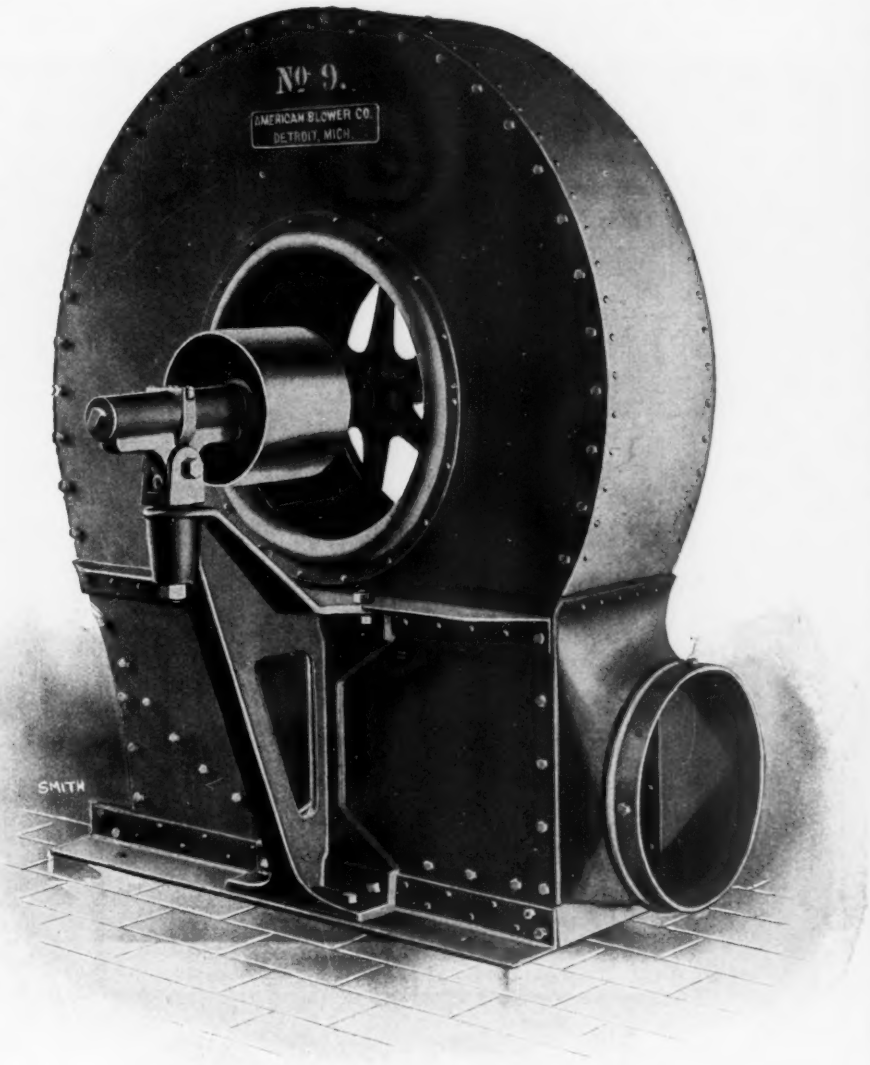
General Office and Works, Hyde Park, Mass.

New York Philadelphia Chicago London

Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fans, Blowers and Exhausters; Steam Engines, Electric Motors and Generating Sets; Fuel Economizers; Forges, Exhaust Heads, Steam Traps, Etc.

568

"ABC" Steel Pressure Blowers



Housing: Of heavy annealed steel plate; perfectly rigid, air tight, and will outwear any cast-iron housing.

Wheel: Malleable iron spider, sheet steel blades; tested for balance up to nearly double the speed it will regularly run.

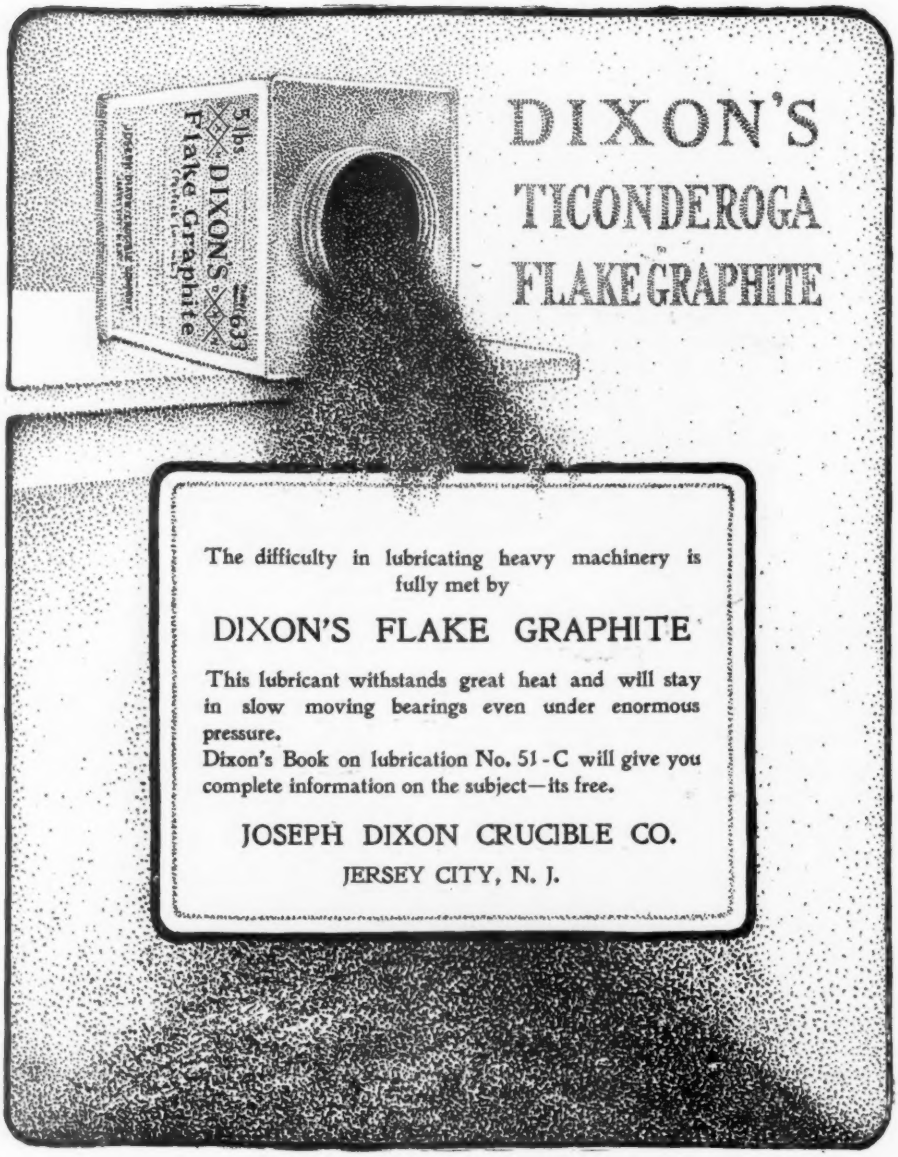
Bearings: Special care is exercised to make them so they will run smooth and cool and last a long time.

Ask for new Catalogue No. 190-A

AMERICAN BLOWER CO.,

DETROIT

New York **Chicago** **London**


5 lbs
DIXON'S
Flake Graphite
No. 637
DIXON'S
TICONDEROGA
FLAKE GRAPHITE
The difficulty in lubricating heavy machinery is fully met by
DIXON'S FLAKE GRAPHITE
This lubricant withstands great heat and will stay in slow moving bearings even under enormous pressure.
Dixon's Book on lubrication No. 51-C will give you complete information on the subject—its free.
JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY, N. J.

We cordially invite the representative **Brass Foundry** interests of the country to a complete investigation of the **advantages** and **merits** of

The "Steele-Harvey"

CRUCIBLE BRASS MELTING FURNACE

over the old coke or coal method.

Our experience and knowledge of the interests of the Foundry has been based upon an experience commencing with the old way, and developing by degrees to the present, in connection with Oil or Natural Gas and Air. We do not claim **impossible** or **extraordinary** advances, but a development of the method of melting, which is **clean, economical, labor saving**, above ground, **no ashes,** or **waste** of metal therein, a **reduction** in **cost** of fuel, using that only **which is necessary to melt** a given quantity of metal, **one** furnace doing what **3** similar coke crucibles formerly accomplished. An honest machine, which if purchased will economize for cost value within a short time, **rapidity** of **melting**—reduction in **loss**—and extension in life of crucible—maintaining a **high quality** of **metal**

Our Standard

IN MELTING POSITION

(Patented in the United States and all foreign countries.)

IN POURING POSITION

When you want it—"**It is there with the goods.**" **Do not hesitate,** but request one on **trial** and **approval,** and acceptance when satisfactorily demonstrated by our representative. On account of the enormous demand we have doubled our plant capacity and are in position to ship within 24 hours of receipt of order.

Built for capacities from **120** to **1,500** lbs. **per heat.**

Don't delay—"the other fellow will get ahead."

Write for Catalog.

The Monarch Engineering & Mfg. Co.

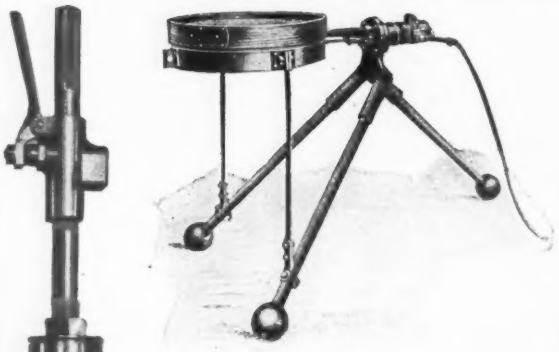
BALTIMORE, MD, U. S. A.

Works: Curtis Bay, Md.

EUROPEAN DEPOT—J. W. Jackman & Co., Ltd., "Caxton House," Westminster, London.

FOUNDRY APPLIANCES

Simple—Durable—Reliable
and Fully Guaranteed

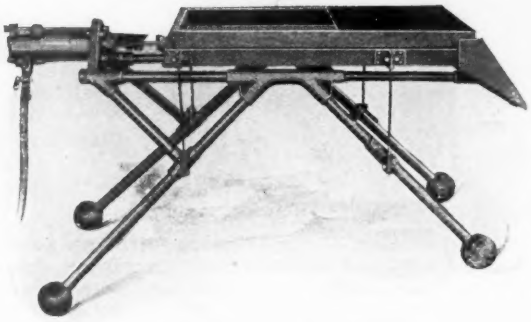


Chicago Tripod Sand Sifter No. 1

"Boyer"
"Keller"
and Improved
"D" Chipping
HAMMERS
One hammer will
do the work of
from 5 to 8 men.

"Keller"
and
"Chicago"
Sand
Rammers.

"Chicago" and "Keller"
SAND RAMMERS
are used by all modern
foundries. They are
fitted with stuffing boxes
and hardened bushings
to protect them against
wear.



Chicago Self-Cleaning Sand Sifter No. 3

Sent on trial to responsible parties.

Send for catalogues and prices.

Manufactured by

Chicago Pneumatic Tool Co.

CHICAGO—NEW YORK.

Branch offices everywhere.

The Test of Quality

LIES IN SERVICE

LINDSAY chaplets have proved a superior quality and service to foundrymen familiar with their use.

Their merits and advantages are readily appreciated.

Our facilities permit shipments of standard sizes in any quantity, at any time,—also many special sizes carried in stock for customers.

LINDSAY CHAPLETS are made of the best soft steel which readily fuses with cast iron or steel.

The heads are all round and held rigidly in place by the fillet underneath and and the upset on top.

These chaplets are tinned with pure tin and may be carried indefinitely without fear of rust.

W. W. LINDSAY & CO.
PHILADELPHIA, PA., U. S. A.
Cable Address "Lindiron."

America's Best

We refer to iron---Cherry Valley Iron. A soft, strong and uniform quality for the foundry, obtained by careful selection of ores and closest attention at the furnaces. If you make machinery castings for particular people, Cherry Valley Iron is what you need. It's easy enough to be granted a small concession in price on an off-grade Iron, but you pay dearly for it in the end. Know, as hundreds of foundrymen do, those qualities that make famous the

Cherry Valley Iron.

Cherry Valley Iron Co.
Pittsburg, Pa.

There's Always a Best. In Pig Iron It's Pioneer.

A high quality iron that's always soft, strong, uniform and clean. Used everywhere by foundrymen who want money-saving results. Only carefully selected ores and fuel from our own mines and ovens used in its manufacture.

Cut out the loss from defective castings— use Pioneer.

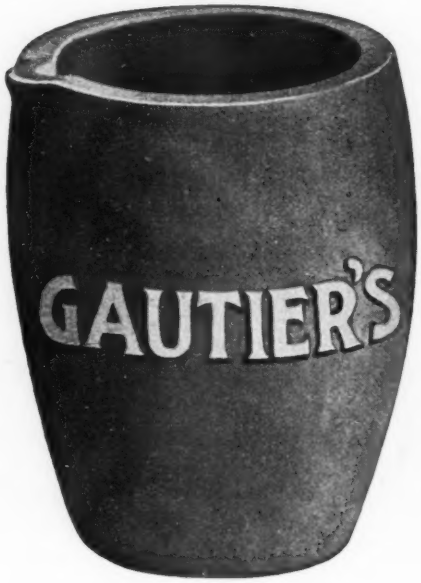
The Republic Iron & Steel Co.

Chicago, Ill. **Birmingham, Ala.**

Sales Offices

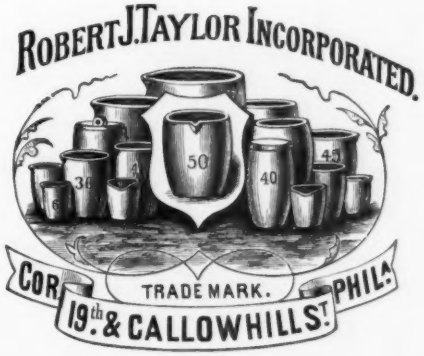
Cleveland, Ohio, St. Paul, Minn., Cincinnati, Ohio
St. Louis, Mo., Buffalo, N. Y., Pittsburg, Pa.

A Dependable Crucible for all Metals



The Standard
of crucible excellence
and uniformity, for half a century

J. H. Gautier & Co.
JERSEY CITY, N. J.



This trade mark stands for the acme of crucible uniformity.

If you are not satisfied with the results you are receiving, the "Taylor" Crucibles will bear investigation. They are the result of years of most careful study.

A trial will convince you.

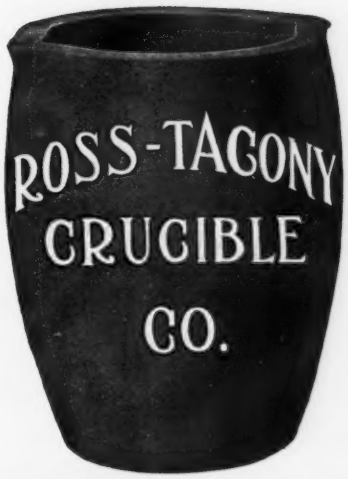
Robert J. Taylor, Incorporated

1900 to 1916 Callowhill Street
PHILADELPHIA, PA.

The largest steel and brass manufacturers use McCullough-Dalzell Crucibles. They prefer them because they have been proved by actual test. Send us an order.

McCullough-Dalzell Crucible Co.

Pittsburgh
Pa.



Test the merits of our special crucible made for the new oil or gas crucible furnaces. Customers report excellent service. ¶ All Ross-Tacony products are made on the principle of durability.

SEND YOUR ORDERS TO TACONY, PENNA.

C. E. Mills, Specialist

REFERENCES GIVEN TO THE LARGEST FOUNDRIES IN THE COUNTRY.

MILLS DRY CORE COMPOUND

No. 1 for heavy or ordinary Core-making No. 2 for any work, but is especially adapted for Malleable Iron, Brass and Steel Foundries. It goes three times as far as Rosin, and twice as far as Flour. No blow and no absorption of moisture.

SYRACUSE X-XX-XXX CORE OILS

Perfect adaptation for all work. Best Core Oil on the market.

SYRACUSE LADELENE COMPOUND

Facing, Core Wash, Lining for Ladles, Cupolas, Locomotive and Stationery Fire Boxes, Gas Work, etc.

Half the cost making cores with our MILLS DRY CORE COMPOUND.

We have Agencies in the following cities, who carry our goods in stock, whose territories are as specified:

GOLDEN RULE OIL CO., 171 Washington St., Chicago, Ill.
Agents, Cooke County, Illinois, and State of Iowa.

HILL & GRIFFITH CO., Cincinnati, O.
Southern Agents.

WHITEHEAD BROS. CO., Providence, R. I.
Agents for New England.

THE DOMINION FOUNDRY SUPPLY CO., Ltd., Agents for Canada.
Offices and Warehouses—122 Wellington St., Toronto, Ont.
and 47 Murray St., Montreal, Que.

C. E. MILLS OIL CO.

Sole Manufacturers

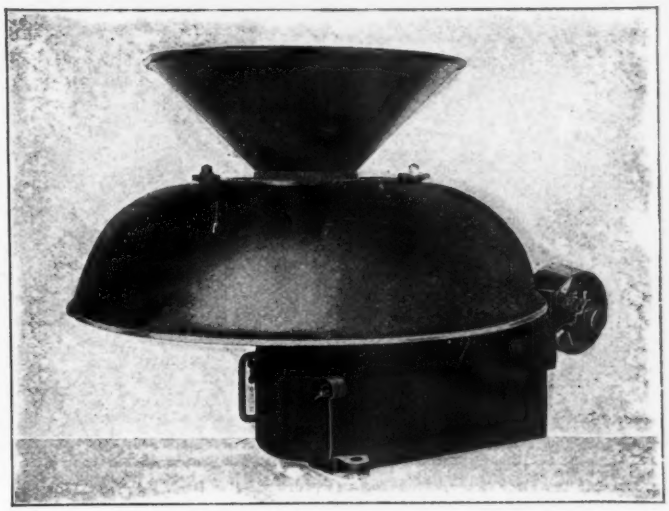
SYRACUSE, N. Y.

William Sellers & Co., Incorp.

PHILADELPHIA, PA.

Modern Machine Tools

We illustrate hereunder one of our specialties for Foundry use, which has proved very satisfactory and profitable in service.



Centrifugal Sand Mixing Machine

We have furnished these machines to many users and shall be pleased to supply full particulars upon application.

TRAVELING CRANES JIB CRANES

SHOP TURNTABLES

Improved Injectors for Boiler Service

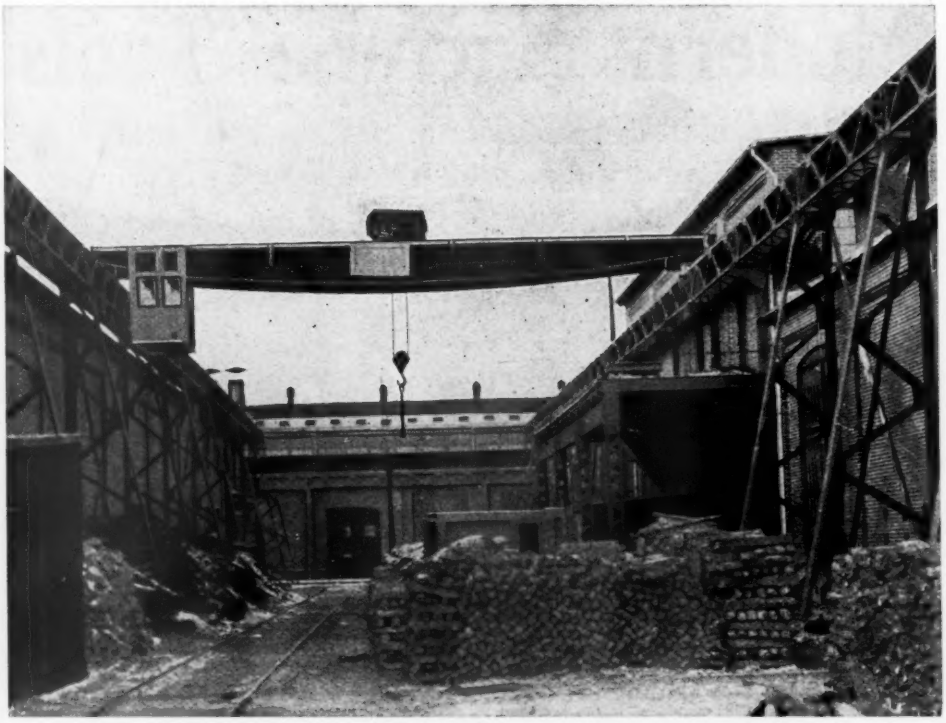
SHAFTS, HANGERS, PULLEYS, COUPLINGS, Etc.

FOR THE TRANSMISSION OF POWER.

WHITING FOUNDRY EQUIPMENT CO.

General Office and Works, HARVEY, ILL., U. S. A. (Chicago Suburb)

Engineers Designers Manufacturers



Three-Motor Electric Traveling Crane, 10 tons Capacity, for Canadian Pacific Railway, Montreal, Quebec. Serves as foundry elevator, handling all stock.

Cupola, 2000 in use.

Electric Travelers Cranes of All Types

Cupolas and **Machinery** for **Complete equipment** of **Foundry Plants. Contracts taken covering buildings** and **entire Installations. Inquiries Solicited.**

New Crane Catalog just out. Send for it.

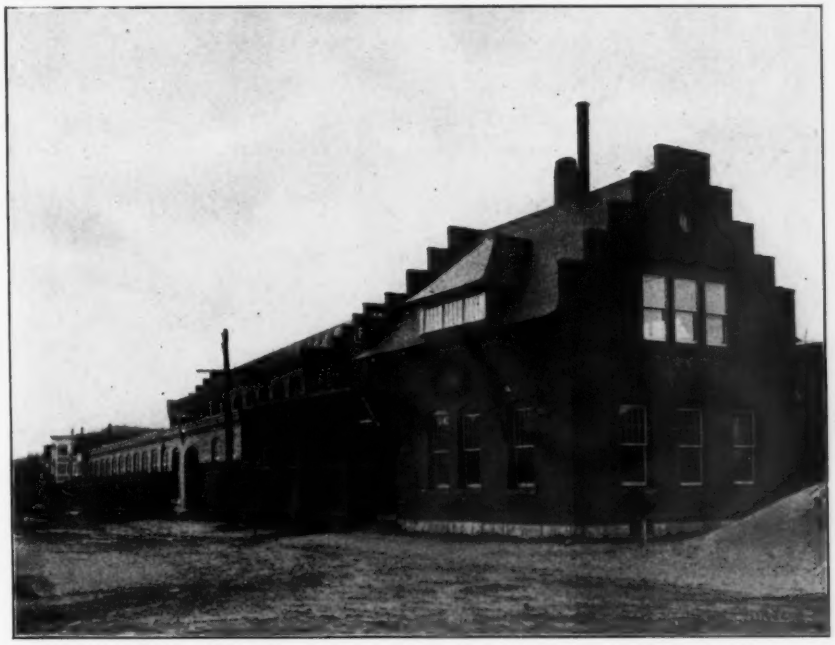
THE FOUNDRY

Vol. 28, No. 6. *CLEVELAND, OHIO, AUGUST, 1906.* *Whole No. 168*

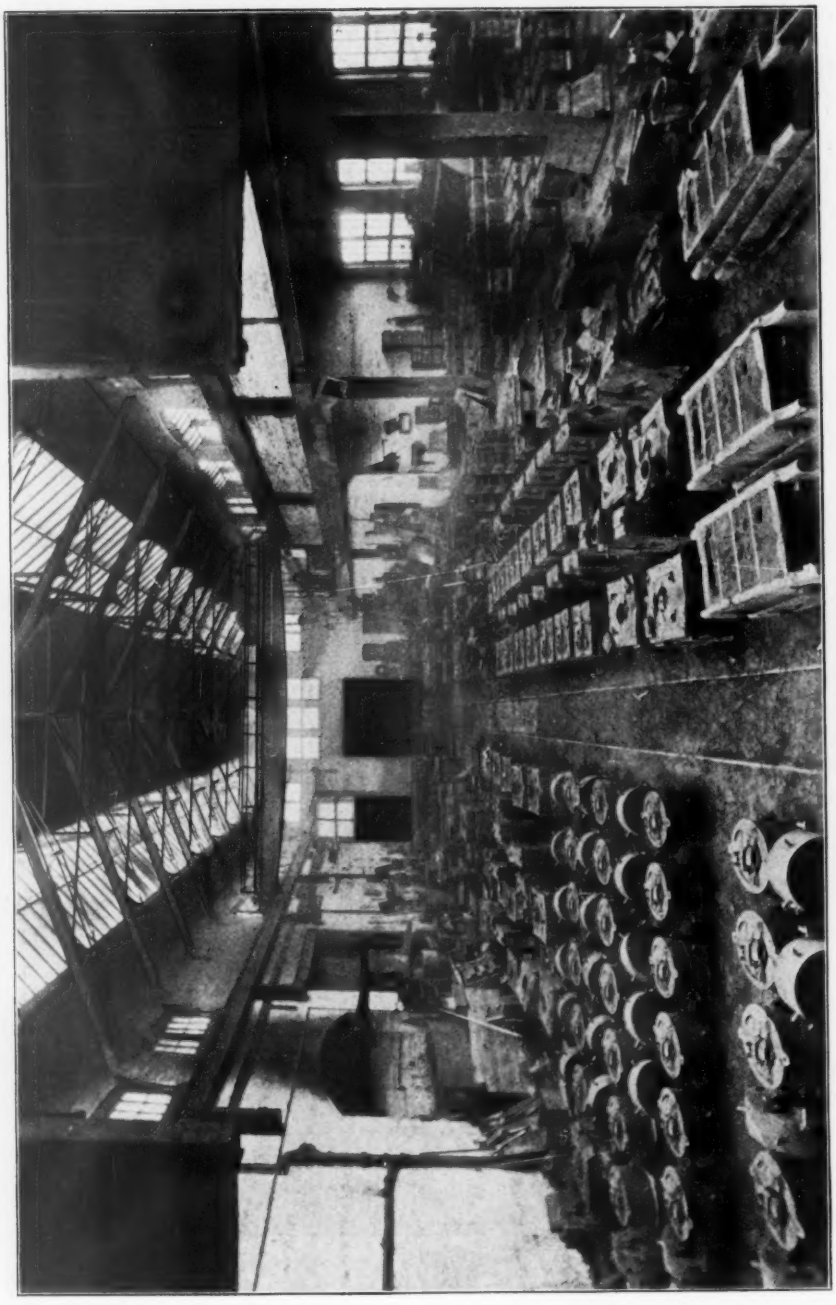
The Manufacturers' Foundry Co., Waterbury, Conn.

The Manufacturers' Foundry Co., Waterbury, Conn., may be called a firm of "specialists" in the foundry business. Its foundry is fitted up, not as a general foundry in which special jobs which may happen to come in are sandwiched in between orders for cheaper work, but it has been built and equipped for the purpose of turning out only that class of castings which demand extra care, great accuracy and high skill. There are many foundries which undertake to fill special orders, but this is one which is devoted exclusively to work of unusual difficulty. In a plant of this kind the cost of labor is relatively very high and the melt and tonnage output relatively small.

Lately, automobile builders, who as a class of manufacturers are using enormous quantities of castings in which lightness combined with strength is required in an unusual degree, have furnished most of the business for this foundry, but other lines of manufacture in which the same qualities are required are also represented in a



EXTERIOR OF MANUFACTURERS' FOUNDRY CO. OFFICE BUILDING IN FOREGROUND.



MAIN BAY OF FOUNDRY.

great and interesting variety. The demand for automobile engine cylinders has at times almost monopolized the resources of the plant, but the books show a sprinkling of all sorts and manner of unusual orders, some being of extraordinary intricacy, others a special mixture of iron, and still others of an unusual degree of strength.

In building the plant the requirements of close work were constantly kept in view. Thus, to a journeyman molder who has seen the interiors of many foundries the main floor and the

various shops of the Manufacturers' Foundry Co. plant are remarkably light. There are a generous number of windows, the roof of the main bay is largely of glass and the side walls are painted a light color. But what will most astonish one who has spent years groping in semi-darkness and sand is the statement that the skylights and even the walls are actually washed down at least once every two weeks. In molding a small automobile engine cylinder in which the walls are only one-eighth inch thick and the valve seat and the inlet and outlet are jacketed as well as the main barrel, the accurate placing of cores is imperative. The variation of a fraction of an inch which the typical oldtime molder would calmly ignore, would mean failure and the scrap pile. Hence the unusual supply of light and the willingness to pay extra wages so as to secure a full team of only high-class molders, who will make accuracy their aim and take pride in their work.

CORE ROOM AND CORE OVEN.

The plant is situated on the main line of the New York, New Haven & Hartford railroad, a spur track bringing cars beside the fuel and stock bins. An industrial track system, the rails laid in cement, gives access to the different parts of the yard and buildings. The rolling stock employed is, with the exception of the ladle cars, of the firm's own design and construction. The yard is divided into three alleys for the storage of flasks, each division having a spur of the industrial track. At present the premises are a bit crowded, but additional ground has been purchased for extension.

The main building is 225 feet long by 80 feet wide. The main bay is 40 feet wide and is served by a Niles-Bement-Pond traveling crane of 10 tons' capacity and 28 feet lift, driven and operated with Crocker-Wheeler motors. The bench shop is in one of the side bays and is 20 feet wide and 120 feet long. The other side bay is occupied by the core room, 100 feet long; the engine and boiler rooms; the testing department, and the cupola. The offices are located in a separate building 40 feet square and two stories high.

Most of the high-grade, hard wood and metal patterns employed in the plant are not made on the premises. There is a pattern storage room 30 by 50 feet which is used for storing patterns in actual use only, permanent patterns being kept elsewhere. Shelves of a special design afford about 2,000 square feet of space. The shelves were designed by E. W. Beach, manager of the plant, and are entirely fireproof. The shelf proper is supported upon cast iron brackets held in place by a set screw upon a 2½-inch iron pipe upright, which is set in place by slipping it into a cast iron collar attached to a joist above and giving it a few turns to engage the threads in a similar collar fixed upon the floor. After placing the brackets and uprights the shelves were formed by running a one-inch angle along the bracket ends, placing a horizontal sheet of expanded metal in the frame thus formed and applying a coat of cement to both sides. Some of these novel shelves have been in use for nearly four years and are still in excellent condition.

The intricate character of the work draws heavily upon the core shop, the number of coremakers employed being equal and at times greater than that of the molders. At the time of a recent visit there were 56 men in the core room. The composition of the core mixture is carefully adjusted to suit the character of casting to be made. Two men measure and prepare material for the entire core room force, about three tons of fine bank sand being used per day. The equipment of the core room includes a Hanna steam sand riddle, a Paxton hand sifter, and two large brick ovens having a shelf capacity of about 3,000 square feet and fired with coke from one central pit. There is, besides, a five-foot Millet oven. The brick ovens are of the firm's own design and one of them is served by a swinging crane for handling heavy pieces. The crane is so placed that it may be swung into the main bay into the field covered by large traveling crane. The other oven has a regular charging truck.

INTERIOR OF CORE OVEN.

The temperature of each core oven

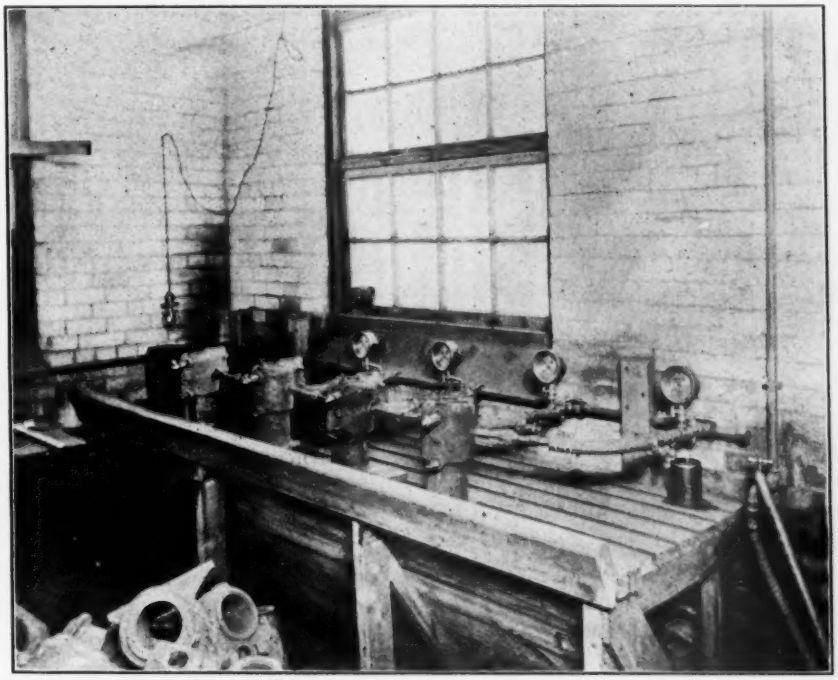
is carefully regulated according to the readings of a Bristol recording pyrometer. The tracings on the circular records show the exact temperature at any time during the day and night, thus affording an excellent check on the watchman. The records are kept on file and a reference will show the exact conditions under which any particular piece of work has been done.

In a foundry where the core shop is of such prime importance all the most improved devices are, of course, in evidence. A standard core oil is employed and for venting great quantities of wax wire taper are consumed daily. A wax press designed and manufactured on the premises furnishes a remarkably tough vent wire in sizes ranging from 3-64 to ¼ inch in diameter. The composition of the wax employed is the result of long experiment and is one of the cherished secrets of the establishment.

The work of the molders consists largely of assembling cores and the molding floor is supplied with an abundance of light and every facility for securing the greatest possible accuracy. No torches for peering into dark corners are required even on dark days. For repetition work there are four Pridmore molding machines, two round and two square. Whenever duplicate work renders it desirable, iron flasks are provided.

The metal is supplied by a No. 5 Whiting cupola blown by a No. 9 Sturtevant fan, which in turn is driven by a 32-horsepower Crocker-Wheeler direct-current motor. The charges are weighed upon the ground level, individual scales being provided for fuel and metal. They are assembled below and hauled up an inclined track in a car drawn by a cable wound upon the drum of an electric hoist motor. The charges weigh one ton each. One melt per day supplies sufficient metal for 65 molders, the quantity of iron consumed being of comparatively small importance in the class of work to which the entire plant is devoted.

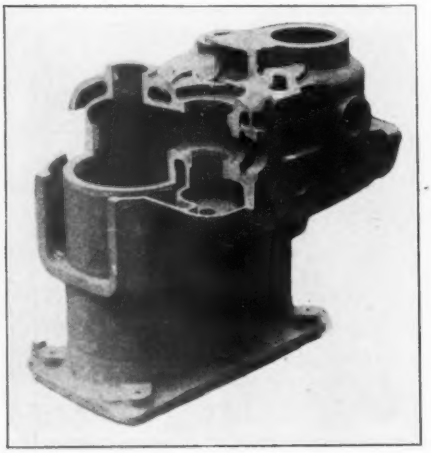
For handling the molten metal as it



HYDRAULIC TESTING BENCH FOR AUTOMOBILE CYLINDERS.

comes from the cupola there are three Whiting geared ladles the largest having a capacity of six tons and two Sturtevant buggy ladles to run upon the industrial track.

The sand is stored in a brick store room fitted with steam pipes to ensure perfectly dry material which can be converted into a homogeneous mixture when run through the foundry mixing pan or grinder.



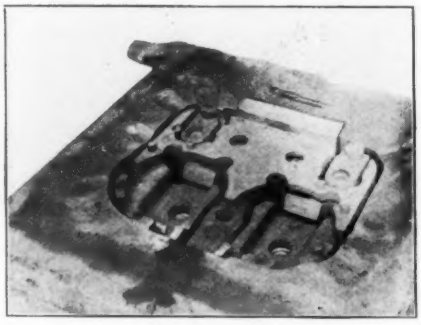
A CASTING SHOWING INTRICATE CORE WORK.

The cleaning and chipping room gives employment to about 15 men. The equipment includes two 36-inch steel tumbling barrels manufactured by the John Henderson Co., of Waterbury. These are driven by belt from a shaft and a seven-horsepower Crocker-Wheeler motor. There are two regular double-end grinders carrying 24 by 3-inch wheels, also driven by belt from the line shaft. All of the work goes into the pickling room where a tilting pickling platform of the Sturtevant type and built upon the place is installed.

The department for testing the integrally cast water-jackets of automobile cylinders is of considerable importance in a plant where engines of this character and other explosive motors furnish the bulk of the work. All cylinder jackets are subjected to 120 pounds hydraulic pressure and carefully examined under pressure. For closing the holes in the castings preparatory to admitting the water and supplying the necessary connections and air outlet an ingenious plug is employed. The mere insertion of the plug and a twist of the wrist serves to close rough holes perfectly, the actual form of the opening making little apparent difference. This device, which is also due to the inventive skill of one of the firm's employes, is protected by a patent. It is extremely simple and enables one man to test upward of 100 cylinders per day.

Pending the installation of an additional engine and motor, the power equipment is habitually carrying an overload of fifty to sixty per cent. The engine room is finished in white tile wainscoting and floor. The present equipment consists of a 45-kilowatt direct-current Crocker-Wheeler generator direct connected to a Harrisburg standard engine.

Adjoining the main bay of the foundry is the carpenter shop for making and repairing flasks. The elevation of the floor above the level of the rails of the industrial track which enters along one side is the exact height of the car platform, an arrangement which greatly facilitates the handling of heavy flasks and saves exertion in innumerable ways.



CYLINDER MOLD WITH PART OF THE CORES IN PLACE.

The lavatory is provided with modern toilet facilities and has expanded metal lockers manufactured by the Providence Machine Co., of Pawtucket.

The work performed in this highly

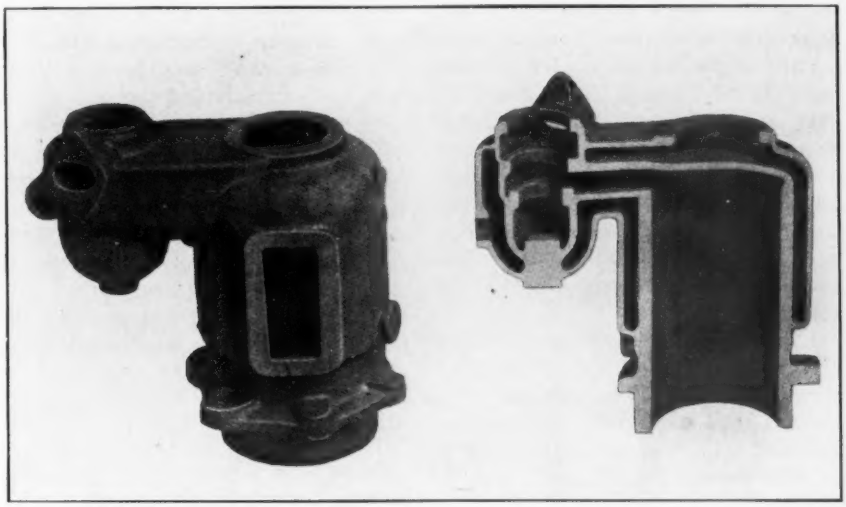
specialized foundry requires intelligence on the part of the men in an unusual degree. For this reason the managers are constantly on the lookout for the exceptional mechanic who is capable of earning more than the ordinary scale of wages.

"We have room for ten men," remarked the foundry superintendent, L. N. Perrault, "and we are prepared to give them $4 per day. But we want the crackerjacks, and the crackerjacks will feel at home here."

found by experience to be the most suitable for the job in hand. Like all other factors which go to make or mar the casting, the composition of the metal and therefore its quality, are constantly under control in this foundry.

THE POSITION AND THE MAN.

"What kind of a (take a lot of cuss words and sprinkle them through as your judgment dictates if you wish to know how this man's talk really



TYPE OF CASTING MADE BY THE MANUFACTURERS' FOUNDRY.

When asked what quality in a molder seemed to him most desirable in his foundry, Mr. Perrault replied unhesitatingly: "Accuracy—accuracy in placing the cores and accuracy in all things. That is our aim in performing the delicate work entrusted to us, and we must have it among our men."

Besides orders requiring unusual intricacy, there are many inquiries for castings of iron of some specified analysis. These receive the same care and attention given to the most delicate automobile work. All cupola mixtures are calculated upon the analysis of the ingredients, and it is possible to produce any desired composition. However, in the work commonly required, the composition is not varied but is kept strictly uniform to analyses

sounded. I do not want to spoil the looks of the paper and so leave them out) place do you call this anyhow. I have worked for a good many mean companies but I think this one has the meanest of them beat. They don't need to think that I am one of the kind that they can ride over for I will mighty soon show them. I don't care if they were as rich as the Standard Oil Co. I would fight them to death but what I would have my rights.

"They can take their job and go straight to"—"What in the world is the matter with you?" broke in the foreman. The man had come up in an excited manner and without any explanation had started into the body of his subject in a very forceful way. His

voice had risen and he was almost insane with anger.

"Matter with me! Matter with me!" he yelled, waving his fists in the foreman's face. "You'll soon find out what is the matter with me. Do you think I am going to slave my life out here and then be cheated out of it?

"Any man that works here earns every cent that is coming to him and I intend to have all of mine or know the reason why."

The men had heard the loud talk and had gathered around to hear what it was all about. The man who thought he was being imposed upon was the highest paid molder working there.

"If your pay is not right you need not get excited about it. How much should you have had?" The foreman had begun to get the drift of it by this time. There had been some overtime in the last pay and the men often got tangled up in figuring when it was broken time.

"I ought to have forty-two dollars and fifty cents for the two weeks," said the man, "and I haven't got it,"

"What have you got? Let's see your envelope." The envelope had on it $42.48. "Open it and see if that is what is in it."

The man did so and found that the money in the envelope agreed with the amount marked on the outside. As soon as the foreman saw this he took two cents from his pocket and handed it to the man. "I don't know where the two cents of difference came in, and it is worth more than two cents of my time to find out, but this will straighten you out. The next time anything goes wrong keep your head until you find whether it is going to hurt you or not. If it isn't there is no use of getting worked up about it."

The man looked a little foolish to see the matter-of-fact, common-sense way the foreman looked at the matter, but as he got all that was coming to him according to his own calculations he had no further excuse for raving. "I only want what is right," he growled as he thrust his pay into his trouser's pocket, and turned away.

"That is all I want too, but I don't always get it as easily as you got the two cents," said the foreman with a laugh. "You will have to hurry up shaking out that floor or you will be late, and it will not be the fault of the company either."

This man was not malicious nor ignorant either, as men go. He was just excitable and lost his head, and the little things were as apt to set him going as big ones, or even more so.

He had held several positions as foundry foreman. He was full of energy and was a good workman. The fact that he had only been with this firm a short time and yet was getting a higher rate than they were paying to any other molder shows that they believed they were getting good results from him. This man's weakness should not be blamed on molders as a class for this lack of self-control was not something that was learned with the trade. He may, and probably did, learn some of the objectionable language with which he expressed his emotions while he was working but the excitability was born in him.

The foreman learned that this man had frequently gotten into trouble by his hasty actions. In one place where he was foreman some little disagreements with the men under him had finally resulted in a strike that should never have been. It only made a lot of trouble without doing anyone any good. His hasty manner often lost him good workmen, and there is no doubt that foremen in general were blamed for things that should have been blamed solely on this man as a man and not as a foreman.

In another case he had gotten into trouble with the firm he was working for. Something had not gone to suit him and he had gone into the office in about the same way that he had gone after his foreman about the two cents and the result was that he was out of a job. It may be that that firm had a poorer opinion of foremen as a class after such an experience but it was not right that they should have.

Once when he was in charge of a foundry help was scarce and not good and he had pushed things along against odds and had done well and just as things were beginning to go smoothly he got irritated about something and left the foundry to take care of itself without saying anything to the firm or the men, but went away and stayed away.

In spite of the fact that he was a large, muscular and active man more than one man had tried to thrash him because of his actions when he was in authority over them and in some places he had gone armed because of the hostility of the men. When not excited he was of good appearance, and could converse well, and made a favorable impression.

If he had been owner of a business I do not doubt but that he would have been in hot water in one way or another most of the time. It was not the position in life that made him act as he did but his unconquered, inborn nature.

If we will think it over a little I think most of us will find that we dislike certain things unjustly. We know some disagreeable person with an unusual name and after that the name is hateful to us. The first person we know well who is a paper hanger deceives us and we have a sort of impression that paper hangers are liars. A boiler maker is a bully and fights and gets drunk, and it takes proof to make us think that any other boiler maker is sober and peaceable. And so it goes. Positions are often blamed for things that should be blamed personally on the individuals who occupy them. The position should not be blamed unless the man does the mean things because of the position he holds. The fact that the position often gives the mean man a chance to exercise his meanness is not the fault of the position, at least not always.

In the interest of justice and of harmony there is another thing that should be remembered. A man may work for a long time for a firm and have a very mean streak in him and the firm may never know it. He is very apt to keep the side with the mean streak in it turned the other way. It may be very, very plain to those on the one side of him and be entirely concealed from those on the other side of him. The firm may be entirely honest and not willing to keep a man in authority who is not honorable in his dealings with the men under his authority, and he may be far from it without them suspecting it, for it often happens that the very men who suffer most will do all in their power to shield him when there is danger of his being found out.

OSCAR W. BURNS.

A NEW HOT BLAST CUPOLA.

BY ZELDE.

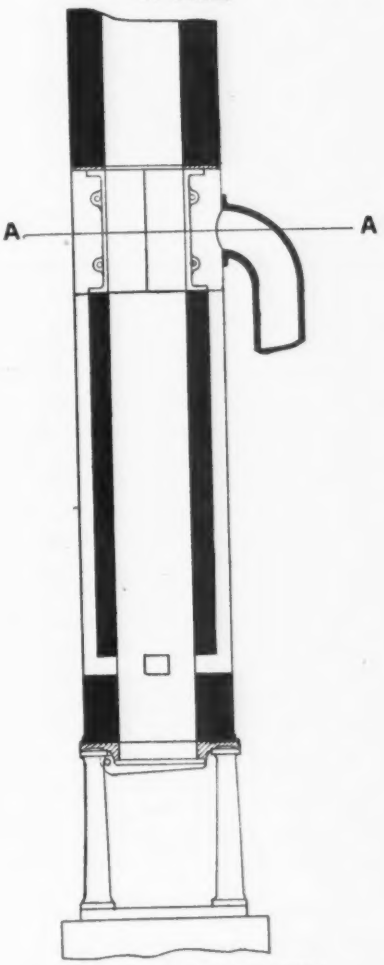


FIG. I.—HOT BLAST CUPOLA.

All iron founders have at one time or

another, looked at the waste heat from their cupola passing into the atmosphere, and wondered if ever a method would be devised to effectively use the hot gases in a simple manner. Numerous experiments have been made from time to time in this direction, none of which appears to have any appreciable success, owing in some measure to the difficulty of finding some material which would stand the great heat without rapidly burning or melting away, when placed in contact with the hot gases. Mr. Higham. of Messrs. Higham & Simpson, Levenshulme, Manchester, England, has recently

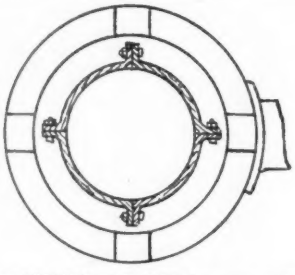


FIG. 2.—SECTION OF CUPOLA ON LINE AA.

patented a method, which would seem to have overcome the difficulty previously mentioned. Fig. 1 shows a section of a cupola fitted with Mr. Higham's arrangement, which together with the sectional plan gives an idea of the patent. A cast iron ring, 3 to 4 feet in depth, is fitted immediately below the charging door. This ring is made in sections bolted together, and can be put to an existing cupola without much trouble. The blast pipe enters the shell of the cupola in the center of this ring and fills the annular belt or chamber, being thus brought into contact with the heat of the cupola, coming through the cast-iron ring. From the lower side of this chamber, four vertical passages lead to the tuyeres and carry the heated blast to the melting zone. Although this method falls far short of the ideal economy of the waste gases it is a good attempt towards it, and is also simple.

A SMALL TEST CUPOLA.

The readers of THE FOUNDRY will remember a statement from John Ricketts last year, concerning a small test cupola which he had in use. We have received the following description of the cupola and its use, from Mr. Ricketts and thinking that it may be of service to others, we are glad to publish it.

The cupola consisted of a bottom plate supported on four legs, and having two lugs for carrying the drop door. Of course, there was an opening in the center of the plate corresponding to the door. The first section of the cupola was made by using a 20-inch pulley rim, ramming it up and casting a piece 12 inches high with two tuyere holes cored in it one inch from the top, and a breast hole near the bottom. These tuyere holes were made just large enough to receive a piece of one-inch gas pipe, the blast being furnished by the compressed air, used in the shop for other purposes, and the pressure regulated by the air valve.

The second section of the cupola consists of a piece of 20-inch pipe, 3 feet long. This gave the cupola a total height of 4 feet. The cupola was surmounted by a tin or sheet iron hood to confine the sparks. In lining the cupola common fire brick was used, holes being cut out to suit the breast and the tuyeres. At the tuyeres the holes were cut out broad on the inside, so as to distribute the wind all the way around the cupola. The interior diameter of the cupola was 12 inches. From the sand bottom to the tuyeres 9 inches. The cupola was a hurry-up job constructed to test certain iron mixtures, and hence, no attempt was made to provide a stack for carrying away the gases.

In running the test heat the cupola was prepared in the same manner used in preparing the large cupola. The fire was lighted, the coke for the bed charged, and when the fire came through showing that the bed was all lighted, it was made up to 18 inches above the tuyeres, and for a trial heat 100 pounds of light side floor scrap was placed on the bed and covered with a riddle full of coke to keep the heat down. All of the coke used was of the best grade procurable, and broken the size of an egg. The 100 pounds of scrap was melted in 20 minutes from the time the wind was turned on. The blast was then

allowed to continue for some time, to be sure that all of the iron was melted. The bed was next made up of the proper height once more, and charged with the pig iron that was to be tested. The pig iron was broken into small pieces, none of which weighed over four pounds, and was charged in the following manner: 50 pounds pig iron was placed on the bed, 20 pounds of coke added, and 50 pounds of iron placed on top of it. The second charge was then covered with a riddle full of coke, which just filled the cupola. These operations were repeated for each succeeding lot of iron to be tested, the blast being allowed to blow for a little while after each charge to be sure that all of the iron was out of the cupola.

The cupola was in operation for four hours from the time it was first lighted up, and during that time nearly 400 pounds of iron was melted. Towards the last of the heat the melting was somewhat slower on account of the fact that the tuyeres became partially stopped. Mr. Ricketts thinks that if necessary 400 pounds of iron could be taken from the cupola in an hour, by having everything ready, so as to charge as rapidly as possible.

It is also probable that better work could be done by experimenting to find the best weight of charges, but this cupola was made to carry on the experiments described, and as it was successful no further experiments were tried.

Such a cupola as this could be rigged up in almost any shop where compressed air was available, and castings needed in case of break down molded and poured at any time. This procedure would be especially advantageous in the case of break downs in mining camps, and small isolated locations.

TRADE PUBLICATIONS.

The Osborn Mfg. Co., of Cleveland, O., is sending out a small catalog 3½ x 6 inches containing 12 pages of very interesting matter concerning the new "Economy" wire wheel brushes. This is a new patent brush, the patent for which was issued June 5, 1906. The brush was developed especially for cleaning castings and metal patterns, for removing scale from forgings, etc. Also for cleaning copper and brass goods.

The Vitrified Wheel Co., of Westfield, Mass., is sending out a standard size catalog describing its emery and corundum wheels. The catalog contains 64 pages of very interesting matter describing the various classes of wheels manufactured by this company, showing the shapes of the wheels and also illustrating and describing the line of grinding stands and grinding machinery manufactured by this company.

The Buffalo Pattern Works, of Buffalo, N. Y., has recently issued a wall map showing the ocean steamship lines, the distance between ports and many other valuable features. This is one of the well-known Rand-McNally maps and is on a sheet 22 x 32 inches. There is a table showing the shipping distance between the different points in the United States and many other facts of interest to business men. This is one of the best gotten up trade publications that we have seen in a long time.

The Whiting Foundry Equipment Co., of Harvey, Ill., (Chicago suburb) has issued a new standard size catalog (6 x 9) describing electric cranes for all purposes. This is a very comprehensive work of 162 pages and in it are illustrated a large variety of electric cranes, transfer tables and hoists of all descriptions. There are over 100 illustrations in the work and it will certainly appeal to any one having handling problems to solve. Frequently by consulting such a catalog one discovers that some one else has encountered the same problem that they have to deal with and solved it in a very efficient manner. In this way one is enabled to obtain equipment which if designed especially would cost many times as much as the price charged by the manufacturer.

The Stanley Electric Mfg. Co., of Pittsfield, Mass., has just issued a 20-page bulletin, 8 x 10½ inches, describing the line of polyphase induction motors for both large and small power requirements.

COMPARATIVE DESIGNS AND WORKING OF AIR FURNACES.[1]

BY RALPH H. WEST.

The excellent articles on air furnaces by Mr. L. G. Blunt in the October, November, and December, 1905 issues of THE FOUNDRY led me to believe that if further data could be obtained, these might be compiled in a manner to interest many foundrymen. With this in view, reports were solicited from those who could assist in this work.

In soliciting these reports it was stated that they would be kept confidential and appear by numbers only.

Nevertheless this will not prevent giving due credit to the firms that were so broad-minded and kind to render the service in question.

There are many different designs of air furnaces, and all are governed by the experience derived in getting the

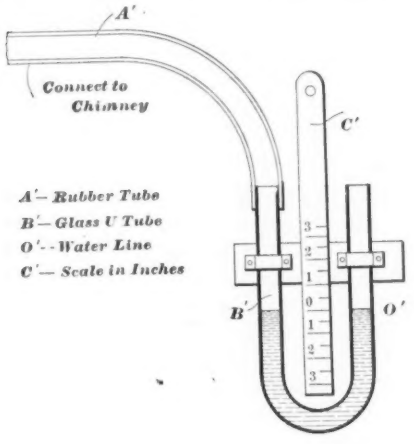


FIG. 1.—DRAFT GAGE.

flame most effective with the least consumption of fuel, to obtain the greatest durability in the lining of the furnace, the tonnage required, the character of the fuel, the supply of air, as well as the draft to obtain the best economy in fuel and speed in melting.

Some of the firms using air furnaces, and hence knowing their advantages, have from two to six in their foundry. There are firms who having two furnaces and requiring but one heat per day will run same alternately, others will take a heat out of the same furnace daily. The advantages of an air furnace over a cupola are: First, in enabling a founder to obtain lower sulphur in remelts. Second, in affording an opportunity to change the silicon, manganese, phosphorus or total carbon contents of the heat while in a melted state. Third, in permitting the obtaining of large bodies of "hot metal" at one tap. Fourth, in obtaining a stronger product from the same brands of iron through the refining action, freedom of contact from fuel, and the ability to manipulate the metal before it is tapped into the ladle. Fifth, in melting large bodies of broken castings or scrap that could not be charged into and melted down in a cupola.

It requires greater skill and care to operate an air furnace than a cupola. There is everything in working the fire, and every precaution must be taken to insure the iron coming down "hot" at the start. If this is not accomplished the temperature can only be raised by hard firing at the expense of loss in silicon, etc. A novice may attempt to take a heat out of the cupola and be successful, but should the same person try his hand at an air furnace, his chances would be excellent to make a very expensive fizzle.

Owing to air furnaces generally depending upon natural draft to promote combustion, the state of the atmosphere has much to do with the speed of melting, and obtaining of "hot metal." Again the same area and height of a chimney will not suffice for the same style furnace in all localities. The variations of surroundings in the matter of hills or high buildings that can affect the force of winds, can cause a more variable action in the speed and quality of the melting, than where a chimney is free from such influences.

In Fig. 1, there is shown a draft gauge that is a very valuable appliance to use. There are times when

[1] A paper presented at the Cleveland (June, 1906) meeting of the American Foundrymen's Association.

doubt may exist as to whether some trouble is due to the fuel, the draft, or the furnacemen; but by the use of such a gauge it is at least possible to define how far the draft was responsible for poor results and narrow the investigation to two factors, the coal and the melter.

THE FOUNDRY of January, 1906, has a valuable article by Mr. N. W. Shed, advocating the use of forced draft and heated air. He illustrates his idea which it will be to the interest of every one affected to study.

In taking up a review of the types presented herewith, the following firms are to be credited for tendering a report on the designs and workings of their furnaces:

Bethlehem Steel Co.'s iron foundry, South Bethlehem, Pa. Tendered by Mr. William J. Shannon.

Buffalo Foundry Co., Buffalo, N. Y. Tendered by Mr. W. W. Shed.

A. Garrison Foundry Co., Pittsburg, Pa. Tendered by Mr. H. C. Shaw.

Lorain Foundry Co., Lorain, O. Tendered by Mr. Geo. F. Stoney.

Watertown Arsenal, Watertown, Mass. Tendered by the commander, Major F. E. Hobbs.

Westinghouse Machine Co., East Pittsburg, Pa. Tendered by Mr. W. A. Bole.

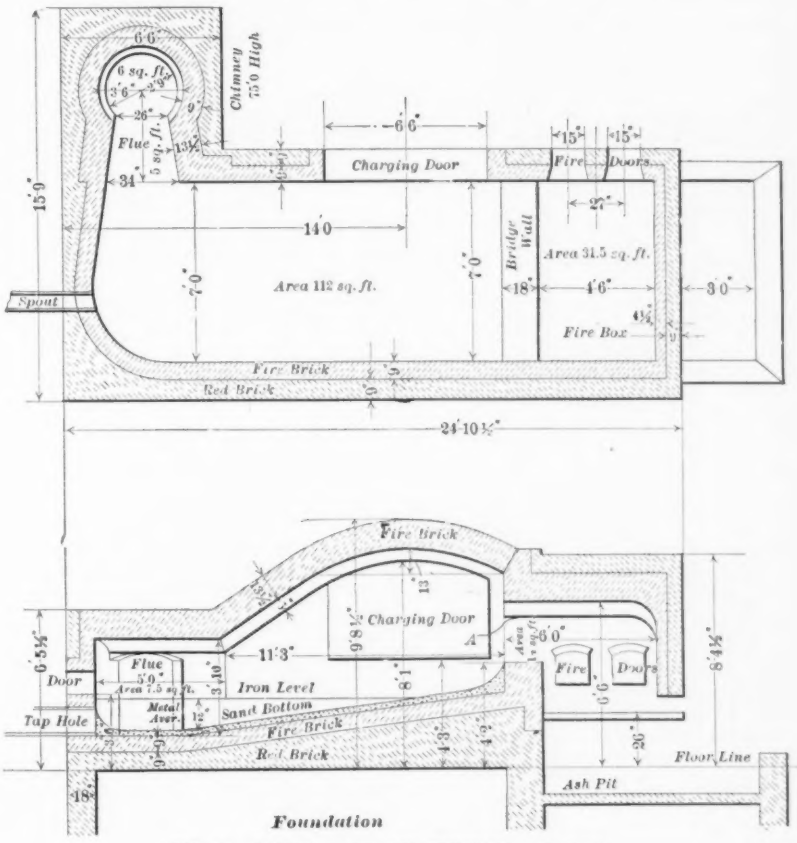


FIG. 2.—CAMEL BACK AIR FURNACE—15 TON.

In taking up the furnaces in the order of their number, we first have Fig. 2, which is of the design known as the "camel-back." The firm owning this furnace has two of them and operates them alternately.

In making the bed or furnace bottom silica sand is used, the depth ranging 1½ inches to 6 inches according to the size of the heats, so as to always main-

tain the same level of slag line as far as practicable. To make room for the large heats the minimum depth of sand is used. All the sand is never taken out, merely enough to remove such bodies as may cling to the slag. For ordinary heats about two wheel barrows of new sand will renew the bottom in good shape. Slab lumber is used to pile iron on and thus protect the bottom when charging the furnace. No trouble has ever been experienced

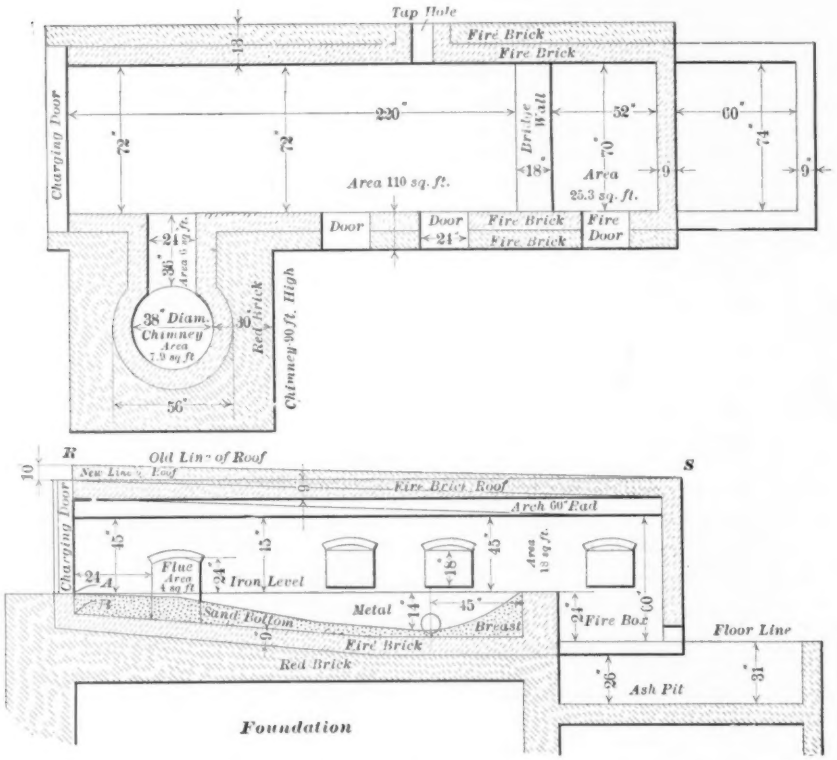


FIG. 3—AIR FURNACE, CAPACITY 10 TONS.

with the bottom. The heaviest iron is charged right behind the bridge wall as near the fire place as possible, which by the way is the hottest place in the furnace.

The greatest burning out of the lining occurs in the throat right over the bridge wall in the top as at A.

Westmoreland county unscreened or "run of mine" gas coal is used. Every carload is refused if found to contain sulphur higher than 1.30. As a rule it ranges from .85 to 1.10. The melting ratio averages about 3½ pounds of iron to one of coal. It generally takes 6½ to 6¾ hours to melt down 24,000 pounds. The charge consists of old rolls and charcoal pig iron.

First iron commenced to melt about two and a half hours after starting the fire. The iron when all melted is "very hot."

It will be well to state at this point that the state of fluidity is designated as "dullish," "medium," "hot," and "very hot."

For patching material, fire clay, lake sand and pieces of old fire bricks are used. A whole new arch is needed at least once a year. The end charging furnace is preferred.

Ten Ton Air Furnace.

This furnace as shown in Fig. 3 has a straight level top. It was originally ten

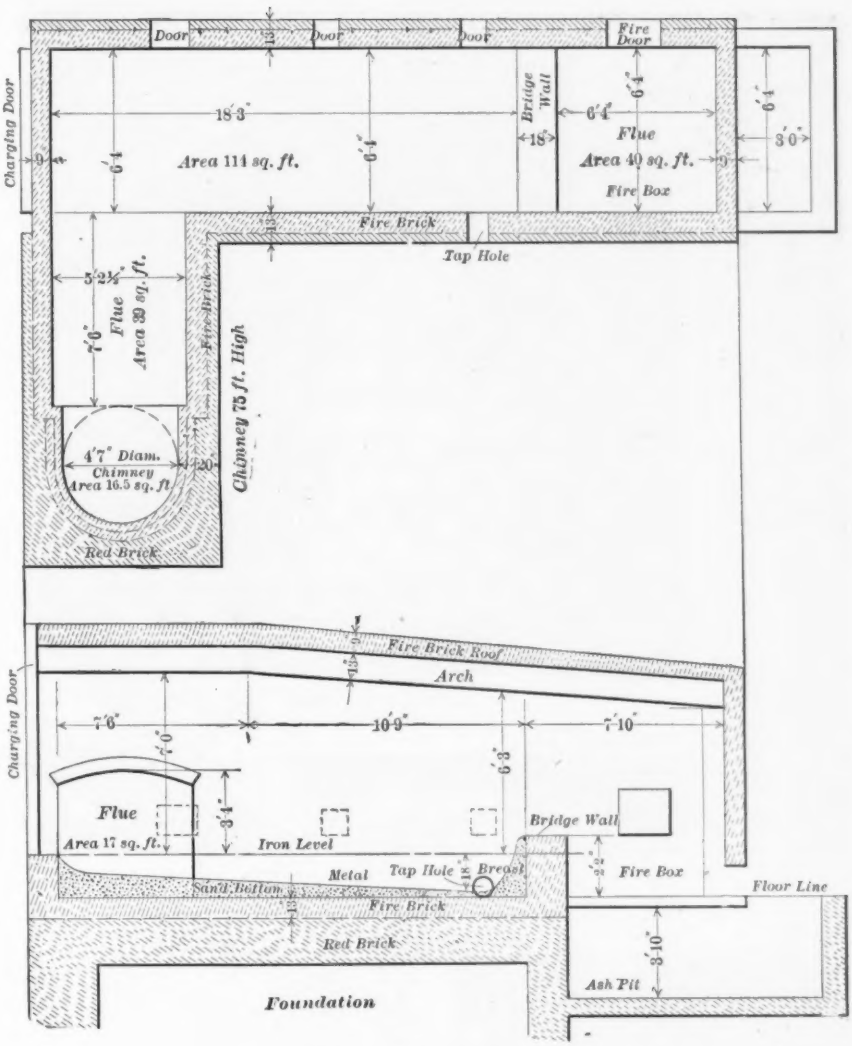


FIG. 4.—AIR FURNACE, CAPACITY 45 TONS.

inches higher at the charging end as in keeping with the dotted lines R. S. The end at R was recently brought down to the level shown, because the flame drew along the top so much that good "hot iron" could not be obtained.

In filling the bottom a good brick foundation 13 inches thick was put in and then silica sand was put in about three inches thick at a time and burned the same as is done in open-hearth furnaces, until the shape required was obtained. For patching up any holes, sand the same as is used for cupola bottom is utilized. This silica sand was about 12 inches thick at the lowest place. No trouble has been experienced with the bottom and only at the tap hole where the cinder and iron remains after the cast is taken out, does it require any patching.

The heaviest iron is charged on the high part of the bottom, just in front of the flue. This is the hottest place in the furnace for melting.

FIG. 5.—CHARGING END OF FURNACE.

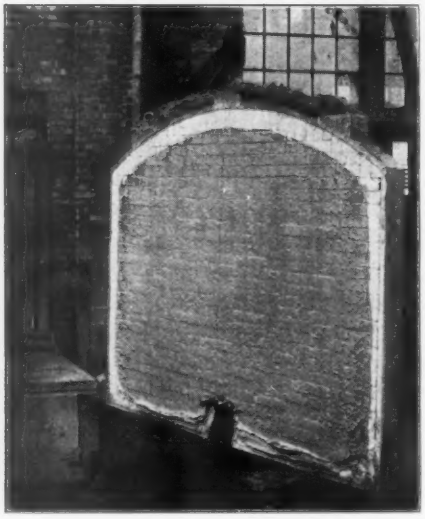


FIG. 6.—FURNACE DOOR.

For patching the slag line etc., a good ganister lining material is used and works very well. "Run of mine" Westmoreland bituminous coal is used, but the big lumps are broken to be no larger than a cocoanut when charged. The greatest burning out aside from the slag line occurs at the flue entrance and between side doors.

A heat of heavy hard scrap and pig iron, taken April 19, 1906 gave ten and a half tons in six hours at the melting ratio of about 1 to 4. The first iron was seen to melt about one hour after starting the fire. The iron was not tapped until one hour and thirty minutes after it was all down, and was "very hot."

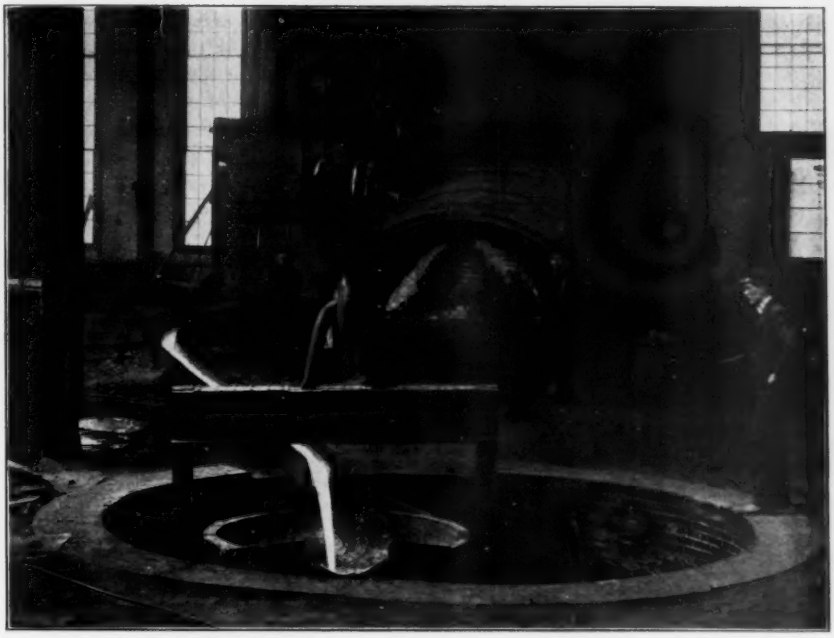


FIG. 7.—TAPPING THE AIR FURNACE.

45-Ton Air Furnace.

This furnace may be called a combination of the Pittsburg furnace and the camel-back. Accompanying the plan and elevation, views are shown in perspective in Figs, 5, 6 and 7. Fig. 5 shows the charging end filled with pig iron, and the furnace ready to be closed, with the charging door seen at Fig. 6. Fig. 7 shows the fire box end of the furnace and the metal tapped and running into a ladle.

The excellent and highly recommended beam that is used for this fur-

FIG. 8.—THE CHARGING BAR.

nace (illustrated in the October 1905 issue of THE FOUNDRY is shown in Fig. 8, and by virtue of this device, the heavy iron is charged up as close to the bridge wall as possible. Those not having such facilities for handling heavy scrap would have great difficulty in attempting to do this with end charging furnaces. Burnt core sand taken from the chipping shop floor is used for making the bottoms. Fig. 4 is a plan and sectional elevation of the furnace.

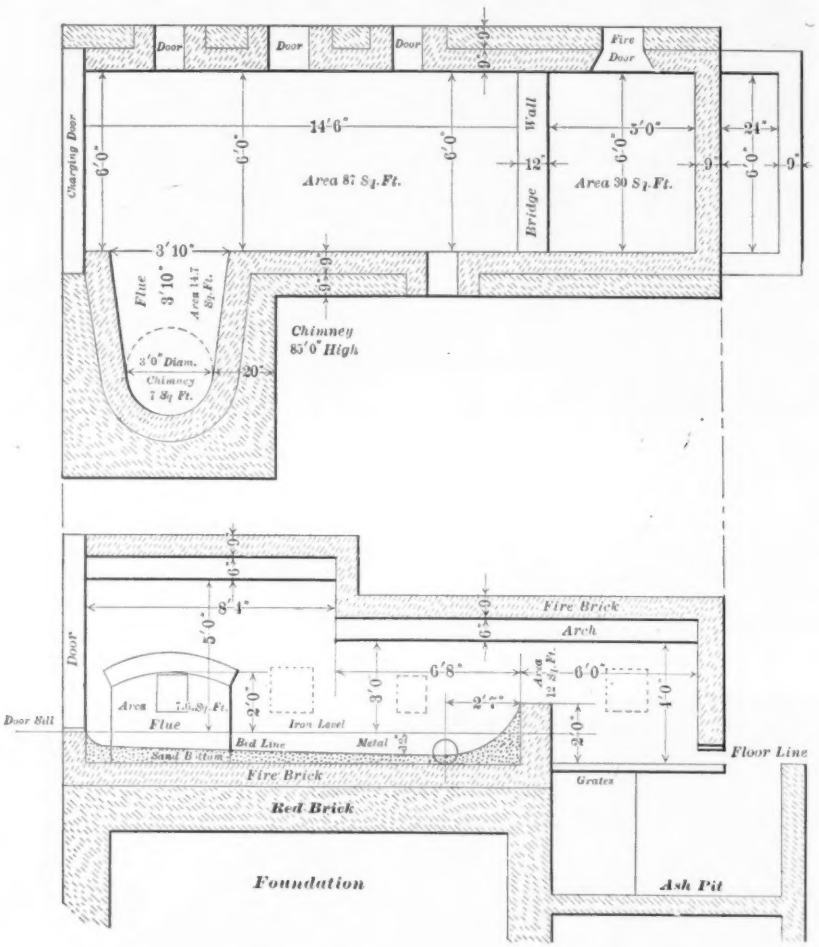


FIG. 9.—PITTSBURG TYPE AIR FURNACE; CAPACITY 22 TONS.

A heat taken April 10, 1906, out of the furnace shown in Fig. 4 of thirty-five net tons was run down in nine hours. The first iron was seen to melt in forty minutes after starting the fire. The iron when all melted is reported as being "hot." The character of iron charged was heavy machinery scrap, weighing from one to ten tons each. For this heat 3 5-8 pounds of iron was melted with one pound of coal. A later heat of twenty-five tons used 12,705 pounds of coal or a melting ratio of 4 to 1; forty-five-ton heats have been melted down at the ratio of five pounds of iron to one of coal.

For a later heat than recorded above the device as shown in Fig. 1, was used for measuring the draft by entering the chimney near the base. When the furnace first started to melt, a ¼-inch draft was recorded and at the close of the heat when the furnace was

the hottest, a one-inch draft existed.

It is stated that the hottest part of the furnace is just behind the bridge wall and from that point to about five feet from the bridge. The greatest burning out of the furnace, Fig. 3, is said to be on the sides of the fire box, rather brick bats to be used with fire clay for patching purposes."

Much stress is laid on the character of the roof shown. It is said:—"We believe this form makes a stronger roof and a stronger furnace; that the roof does not give way so easily; that

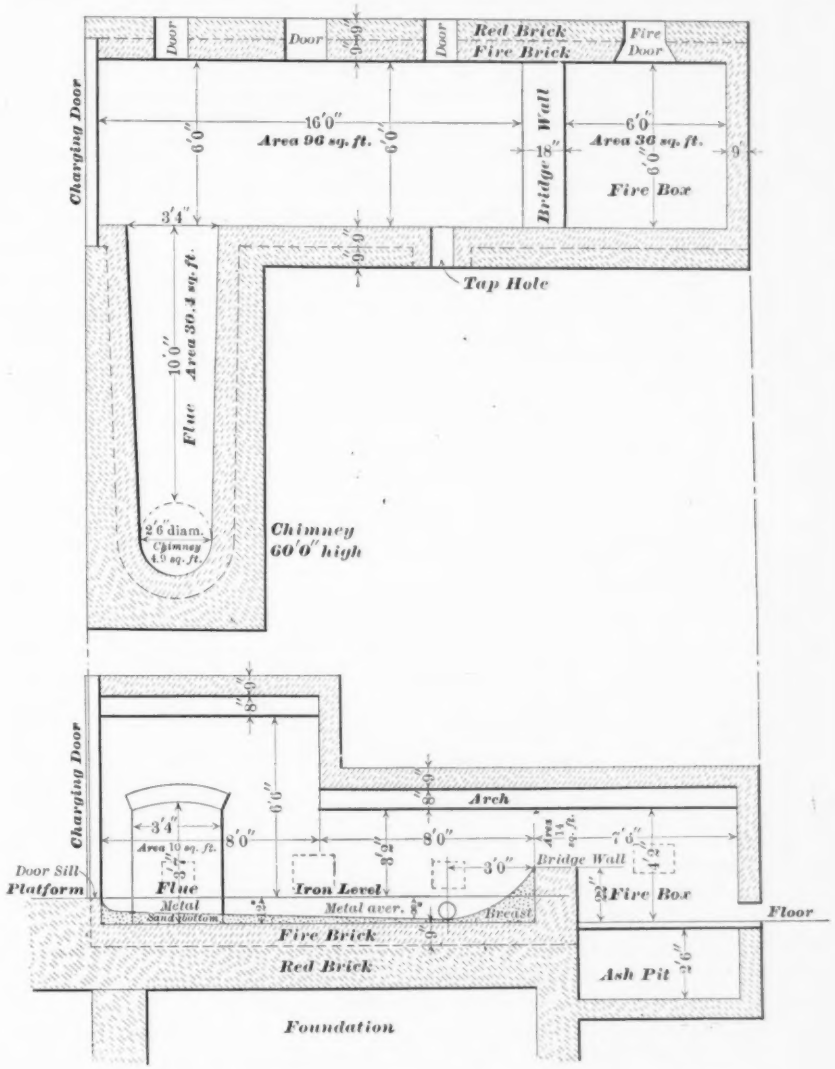


FIG. 10.—MODIFIED PITTSBURG TYPE AIR FURNACE; CAPACITY 15 TONS.

than the roof. The furnace is run daily and the cost of lining or repairing, averages about $24.00 per month.

"Are now using two parts of silica sand and one part of fire clay, and making preparations to grind up fire

the ease of charging is increased, and that in general it is superior to the usual method of making the roof in two distinct heights, as shown in Figs. 9 and 10, which are modifications of the regular Pittsburg type.

Pittsburg Type of Air Furnace.

The type of furnace shown in Fig. 9, in the heat of April 18, 1906, melted down sixteen tons of gun iron, with seven tons of Penn gas coal. The iron was seen to first melt one hour and fifteen minutes after starting the fire. The iron was melted "hot." When running this furnace to its full capacity, 22 tons, the ratio for fuel is quoted as 1 to 2.75. "We charge the heaviest iron at the middle of the furnace. Greatest burning out is found at the slag line and on the sides near the flue. Jersey fire sand and clay is used for patching."

"In a recent melt we determined losses in the following constituents:—silicon 0.17, manganese 0.18, carbon 0.035. The gains were:—sulphur increased 0.001 and phosphorus 0.014. The slight changes in sulphur and phosphorus may be due to error in chemical analysis.

Modified Type of Pittsburg Air Furnace.

The details of this furnace, Fig. 10, are based on average practice. The sand used for making the bottom is molding sand from the floor, which has been used and is put in from six to eight inches deep.

In charging the iron, half pig and half large scrap was used and melted down with select Youghiogheny coal at about the ratio of 1 to 3¾, in about seven hours. The first iron was seen to melt in about two hours after the fire was started. The metal is marked "medium" to "hot." Size of heat, fifteen tons. When the wind blows toward the open grate bars, the furnace

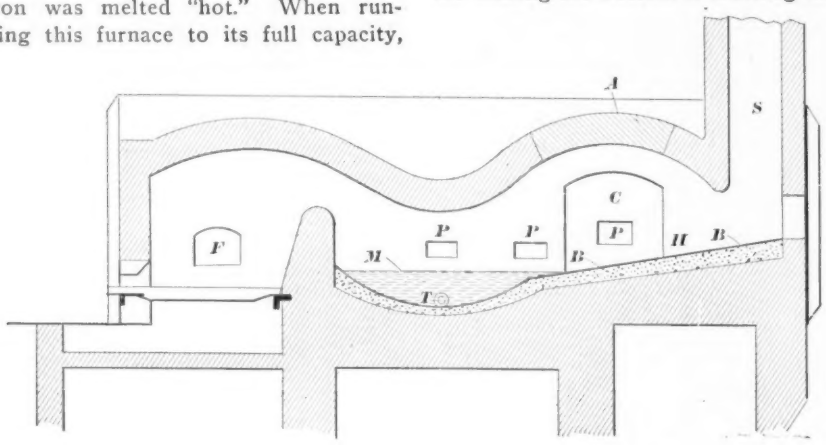


FIG. 11.—ENGLISH FURNACE.

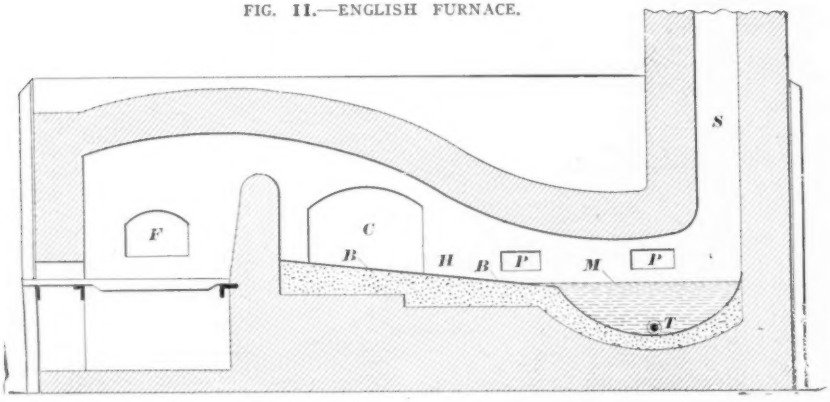


FIG. 12.—ENGLISH FURNACE.

works a little quicker. The greatest burning out, aside from the slag line is about the middle of the roof, half way between the bridge and the flue openings. For patching material, a mud made of one-half fire clay and one-half sand is used.

English Types.

The illustrations, Figs. 11 and 12, are presented to show the designs of furnaces more commonly used in England, as is derived from views shown in "Modern Iron Foundry Practice," published by D. Van Nostrand Co., Fig. 12 being given the preference.

While it appears good logic that the air necessary to support combustion should in passing through the fuel be directed as much as possible upon the metal lying on the bed by the curve of roof, still for all this such designs as Figs. 11 and 12 would seem to be better in theory than in practice, when contrasted with Figs. 3 and 4 and shows us there is a tendency to simplify the contour or curvature of the interior roof lines of furnaces.

It is unfortunate that there are no data for the working of furnaces Figs. 11 and 12, as these would be valuable in enabling us Americans to know where we stand with our English cousins in the question of economy in fuel and speed in melting.

From what information can be obtained on the question of grate surface areas used some years back, it appears that it was figured to be about equal to that of the chimney. With our modern furnaces it will be seen by noting the areas given on the illustration shown, that the present day practice is to have a very much larger grate area, than that of the chimney.

Many different kinds of fuels such as wood, coke and hard coal have been used, but the latter two create large quantities of fine ashes, that fall and cover the molten metal as to prevent the proper absorption of heat. The best kind of fuel is a fairly hard, gaseous, long flaming, non-coking, bituminous coal, that does not contain over one per cent of sulphur.

While there is much in preparing and charging a furnace that might be taken up here, this much can be said, that the operation of firing, to create and regulate a reducing or oxidizing flame, (the former being a heavy white flame, and the latter of a bluish cast similar to that which emanates from cupolas) is what requires the greatest care and skill on the part of the melter.

OPEN HEARTH STEEL CASTINGS.—VII.

BY W. M. CARR.

Chemical Analyses and Physical Tests.

The appended methods of chemical analyses are the result of several years' experience and have proven to be accurate and reliable. In several instances, the methods may be considered as standard, and are in daily use in many leading establishments.

In the manufacture of basic steel castings, where it is highly important to know the extent of dephosphorization as quickly as possible in preliminary tests taken during the progress of a heat, a suitable centrifugal machine is necessary. The same can be purchased through any house dealing with chemical supplies.

Determination of Silicon in Steel.

Five times the factor weight (2.3510 grams) of the drillings are weighed off, placed into a 5¼-inch porcelain dish, and a watch glass placed concave side down. Thirty cc. of silicon mixture are added. The dish is heated until the solution is evaporated, and fumes of sulphuric acid are given off. After cooling, 45 cc. hydrochloric acid, (1 part hydrochloric, 2 parts water) are added. Heat until all is dissolved, except the separated silica. Filter, wash alternately with hot hydrochloric acid (1-1) and hot water, until free from iron and acid. Burn and weigh. One fifth the weight represents the silicon percentage. Time required, fifty minutes.

Determination of Phosphorus in Steel.

Two grams of the drillings are weighed off, placed into a 250 cc. Erlenmyer flask, and 35 cc. nitric acid (specific gravity 1.2) added. The flask is heated until the drillings are in solution, and no brown fumes are given off. Ten cc. of a five per cent solution of potassium permanganate are added, and heating continued until the solution is colored brown, when a few drops of saturated cane sugar solution are added. The solution is cleared, and after heating a few minutes the flask is removed from the heat, and cooled in water. Neutralize with concentrated ammonia, and acidify with concentrated nitric acid until the solution assumes an amber color. To this solution at a temperature of 70-80 degrees Cent., add 50 cc. of ammonium molybdate solution, and a few drops of ammonia to hasten the precipitation. Shake well, and allow to settle in a warm place for ten minutes. Filter, wash with cold water until free from acid. Remove paper to original flask, add from 3 to 5 cc. or more if necessary, of potassium hydroxide solution. Add a few drops of a one per cent alcoholic solution of phenolphthalein. Shake thoroughly, allow to stand for five minutes, and titrate excess of alkali with nitric acid solution. The number of cubic centimeters of potassium hydroxide solution, neutralized by the phosphomolybdates represents hundredths per cent of phosphorus in the drillings. Time required, forty minutes.

Determination of Manganese in Steel.

One tenth gram of the drillings is weighed off and placed into a test tube (1 x 8 inches), and 15 cc. nitric acid (specific gravity 1.2) are added. The test tube is heated over a sand bath until the drillings are in solution, and the nitrous oxide fumes are expelled. About 0.7 grams lead peroxide (PbO_2) is added to the test tube taken from the sand bath, after which it is replaced and heated for one minute, then filled two-thirds with hot water. Boil a few minutes and settle by means of a centrifugal machine. Pour the clear solution into a flask, and titrate with sodium arsenite solution. The number of cubic centimeters of arsenite solution required, represents tenths per cent of manganese in drillings. Time required, twenty-five minutes.

Determination of Sulphur in Steel.

Fifty times the factor weight (6.88 grams) are weighed off, and placed into a 500 cc. Erlenmyer flask. The delivery tube is attached leading into a 100 cc. Erlenmyer flask, which contains 10 cc. hydrogen peroxide, 10 cc. concentrated ammonia, and 20 cc. water. Eighty cubic centimeters of hot hydrochloric acid (1-1) are added, and heat applied. When solution is complete, disconnect the apparatus, make the solution slightly acid with hydrochloric acid, bring to a boil, and add 10 cc. of a ten per cent solution of hot barium chloride. Boil five minutes, filter, using ashless pulp, burn and weigh barium sulphate, and make correction for sulphur in hydrogen peroxide. The weight of barium sulphate, divided by 50, represents thousandths per cent sulphur. Time required, fifty minutes.

Determination of Carbon in Steel.

Weigh 0.3 grams of drillings, and 0.3 grams of standard into separate test tube. Add 5 cc. nitric acid (specific gravity 1.2). Heat in a water bath until solution is complete. Cool in water and compare. Time required, thirty minutes.

Determination of Silicon in Pig Iron.

One gram of the sample is washed off into a 3¾-inch casserole, and a watch glass placed concave side down. A few drops of concentrated hydrochloric are added, then fifteen cubic centimeters of silicon mixture. The casserole is heated until sulphuric acid fumes are given off. After cooling, add 30 cc. hydrochloric acid (1.2), and boil until all is dissolved except the carbon and silica. Filter, wash alternately with hot hydrochloric acid (1-1), and add hot water until free from iron and acid; burn and weigh.

If high in silicon, treat with hydrofluoric acid. The weight multiplied by 0.47 represents the per cent of silicon. Time required, one hour.

Determination of Phosphorus in Pig Iron.

From high phosphorus pig weigh off 0.2 gram and from low phosphorus pig as much as is best suited for the determination. To the 0.2 gram add 25 cubic centimeters of nitric acid (specific gravity 1.13). Boil until the drillings are in solution, adding more acid if necessary. Filter off graphite, add potassium permanganate, and proceed as in the determination of phosphorus in steel. Time required, fifty minutes.

Determination of Manganese in Pig Iron.

Proceed as in the determination of manganese in steel.

Determination of Sulphur in Pig Iron.

Five grams of the drillings are weighed off into a 500 cc. Erlenmyer flask, and a delivery tube connected which leads into a glass containing 10 cc. cadmium chloride solution, and 50 cc. water; 70 cc. hot hydrochloric acid (1-1) are added through the thistle tube, and heat is applied until the drillings are in solution, and steam has driven off all other gases. Disconnect, add a few cubic centimeters of starch solution, 40 cc. hydrochloric acid (1-1), and titrate immediately with iodine solution. The number of cubic centimeters of iodine solution represents hundredths per cent sulphur. Time required, thirty-five minutes.

Preliminary Tests.

Carbon:—Weigh off 0.2 gram of the drillings, and 0.2 gram of the standard into separate test tubes. Heat until solution is complete and compare colors. Time required: Four minutes.

Manganese:—Proceed as in the final test. Do not boil after adding water. Time required, six minutes.

Phosphorus: — One and one-half grams of the steel are weighed off into a 300 cc. Erlenmyer flask, and 35 cc. nitric acid (specific gravity 1.2) are added. When violent action ceases, place flask on heat, boil until drillings are in solution and no brown fumes are given off. For every eight points carbon, add one cubic centimeter concentrated solution of chromic acid. Boil one minute. Transfer to a graduated bulb containing 50 cc. molybdic acid solution, shake violently, and allow to settle in centrifugal machine. Each small division on bulb represents hundredths per cent phosphorus. Time required, five minutes.

Solutions.

Silicon Mixture:

Water .....1,300 cubic centimeters
Nitric acid ..... 435 cubic centimeters
Sulphuric acid ..... 275 cubic centimeters

Add sulphuric acid slowly.

Standard acid and alkali for phosphorus determination:

1 per cent solution potassium hydroxide.
1 per cent solution nitric acid.
100 milligrams oxalic acid crystals equals 10 cc. potassium hydroxide.

Standardize with steel of known phosphorus contents.

Molybdate Solution:

Molybdic acid.....250 grams
Ammonia .....1,000 cubic centimeters

To use, 90 cc. stock solution in 338 cc. Nitric acid 1.20 specific gravity.

Keep acid cool, and stir while adding molybdic acid.

Sodium Arsenite Solution:
Stock solution.

Sodium Carbonate .....15 grams
Arsenous oxide ..... 5 grams
Water .....500 cubic centimeters

Boil and filter.

To use take 68 cc. stock solution to 2,000 cc. water, standardize against steel of known manganese contents.

Cadmium Chloride Solution:

Cadmium chloride .....35 grams
Water ..... 1,200 cubic centimeters
Ammonia ..... 800 cubic centimeters

Iodine Solution:

Iodine .....9 grams
Potassium iodide.....18 grams

Dissolve in a few cc. of water and dilute to two liters. Standarize against American Foundrymen's Association pig iron standards.

Starch Solution:

Mix a tablespoon full of starch with a little cold water, and pour into 100 cc. of boiling water, and continue the

boiling for some time. Shake before using.

Nitric Acid, Specific Gravity, 1.2.

Nitric acid	1,250	cc.
Water	185	cc.

Nitric Acid, Specific Gravity, 1.13.

Nitric acid	645	cc.
Water	1,800	cc.

Physical Tests.

The specifications prepared by the American Society for Testing Materials, are quite generally recognized as being fair to both producer and customer. An objection to be raised is the costly style of the test bars recommended (Fig. 1).

When a large number of tests are to be made in the machine, cutting the threads, greatly increases the cost. When no specifications for physical tests are imposed, the type of the bar shown in Fig. 2, will answer for works tests, solely as a guide to the quality of product, and where the customer does not insist upon the test bar with the threaded ends as illustrated.

The specifications, mainly, are drawn to cover the physical properties and they alone should be considered for the reason that there is no distinct

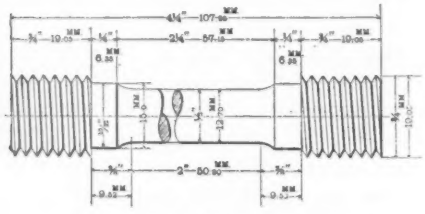


FIG. 1.—STANDARD TEST BAR.

relation between the chemical composition and the physical behavior.

The method of the treatment of castings is the prime consideration, and with a given chemical composition, it is possible to get a wide variation in physical tests with different heat treatments. From the standpoint of the manufacturer, specifications should only be applied to physical tests, leaving to him the adjustments of the processes of manufacture to harmonize with the expected physical requirements.

Test bars can only at best, show the condition their metal may be in, both in regard to the composition and the treatment to which they may have been subjected.

It would not follow that, because, a test bar representing a given heat of steel, gives poor results in tensile or

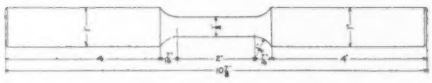


FIG. 2.—TEST BAR FOR WORKS TEST.

bending stress the entire heat was poor also in that. A test bar can only show what might be expected of a finished casting of equal composition if it were to receive the same treatment as did the bar.

Tensile and bending tests serve useful purposes, but still leave something lacking. If a test bar under such stress gives excellent results or if a finished casting be subjected to the drop test, and possibly bends without fracture, proving great ductility, the evidence is not necessarily a positive guide as to life in service. Quite generally a steel casting is set up in service in such a manner that it may be constantly under alternating stresses or rapid and repeated shocks. Practical results from service data do not confirm the theory that ductile steel should resist such strains. Failures under such stresses frequently fall short of explanation in the light of recognized tests projected to prevent such failures. There then arises another want to be filled, a gap vacant because chemical analyses, physical tests and microscopical examinations do not enable the metallurgist to throw around the fruit of his labors the fullest possible precautions intended within the scope of such tests. Possibly fuller information is to be found by supplementing already established tests with other tests to approach as near as possible the conditions to which steel castings are subjected in service, namely—vibratory

stresses. A study of such stresses will no doubt give much valuable information and change certain conditions now thought to be essential.

Relation Between Composition and Physical Properties.

(1) *Carbon.*—In order to understand the matter under consideration it would be well to study the definition of steel. Principally it is a combination of iron and carbon, and certain other ingredients to be regarded further, without any sharply defined limits as to the amount of carbon alloy. On the basis of composition alone the lower amounts may equal those found in wrought iron, and going to the other extreme it is difficult to say where steel ends and cast iron or pig iron begins. The composition of wrought iron in regard to carbon may range from traces to such amounts as 0.07 per cent, yet the softer steels can be produced with as low a carbon as 0.07 per cent, but the physical condition may be quite different as compared with wrought iron. As the carbon increases until a point is reached at or about 2.5 per cent the combination is then regarded as cast iron, the latter being the crudest form from which by various processes of purification and decarbonization many kinds of steel are produced. The process of manufacturing wrought iron is also a purifying, and decarbonizing one with an essential difference whereby, in a sense, the former is a product of a "dry" method, while steel with any range of carbon is the result of a "wet" one. In other words, the temperature of the puddling furnace in which wrought iron is made is not sufficiently high to maintain fusion or fluidity completely during the full interval of the progress in conversion and purification. The initial charge is composed mainly of pig iron with a total carbon of between 2½ and 4 per cent, which readily melts and because of certain active influences gradually loses its carbon but gains in plasticity because of temperature limitations and the type of furnace used, so that at the end of the operation there will be a mass of almost carbonless iron which can be divided into several bulky, spongy balls and worked into shapes. On the other hand, steel making is the result of a process conducted under temperature conditions wherein fusion or liquation is maintained from the time of melting cold stock until such time when decarbonization has proceeded to almost any desired extent, so that with a proper type of furnace and necessary thermal ranges it is possible to equal in composition the commoner analyses of wrought iron. Thus, it will be understood that the content of carbon in the lower ranges will not suffice to mark the division between iron and steel. Another difference presents itself in, perhaps, a mechanical way, that is, wrought iron may contain slag or cinder enveloping its fibres varying in quantity between 0.2-2.0 per cent and which will play an important part upon its physical properties. The presence of cinder is due to the sponge-like formation of plastic wrought iron in its last stage of manufacture enclosing slag or cinder. Steel being produced by liquation permitting a separation of the slag and liquid metal by gravity, the finished product will be practically free from mechanically contained cinder, thus securing a greater continuity or intimacy within itself and therefore more strength than wrought iron containing an equal amount of carbon.

The metallurgy of steel is based principally upon the influence of carbon which controls the familiar properties of strength, ductility, malleability, weldability and most of all, the property of being hardened and tempered. The presence of carbon in iron is purely accidental, due to the use of carbonaceous fuel as a source of heat in smelting iron ores. Had the primitive iron makers stumbled upon some other substance that had a similar power of separating iron from its earthy matters, we might today be working with steel, the most important and useful of all metals, founded upon another basal element. Nature, in her bounteousness, has given us

coal in abundance. It seems the simplest fundamental fuel for smelting iron ores; but owing to the affinity that exists between carbon and iron for each other there results a product highly carbonized, yielding a metal limited in its capacity for strength and ductility.

Carbon is recognized as existing in iron or steel in several forms with a variety of subdivisions; generally it is regarded as two constitutional divisions, one as combined carbon and another as free or graphitic carbon, the former being a definite chemical compound of iron and carbon, expressed by the symbol Fe_3C, and the latter (graphite) nearly pure carbon. It is stated by authorities that iron can carry theoretically, about two per cent of combined carbon and still be regarded as high carbon steel. Should the carbon be carried beyond that point and if heated and cooled slowly the pure or free form of carbon would appear in a small degree and the alloy would then be on the borderland of cast iron. As is well known, wrought iron and the very softest steels are both malleable, ductile and weldable, but as the content of carbon increases, those properties gradually diminish and the skill to work them becomes of a higher order than that required in the softer or milder grades. Cast iron is practically unforgable or weldable merely because of the excess of carbon present either in the combined or free state. Then summarizing the general explanations, steel may be regarded as a matrix of iron in which is dissolved or alloyed varying amounts of combined carbon with an absence of it in the free or graphitic form; a freedom from slag or cinder, the product of a process of liquation or complete fusion throughout the operation of refining and conversion.

Cast steel is a substance distinguished from wrought iron in that during certain stages of manufacture it is sufficiently liquid to pour into such receptacles as metal or sand molds. The composition of the product may cover wide ranges. Wrought iron as already stated is worked up from plastic masses of partially or completely decarbonized cast iron. Open-hearth castings are the product of liquid steel with limited composition poured into molds composed chiefly of silica sand. The physical properties must conform to certain requirements of strength, toughness, ductility and soundness.

TABLE I.

	Carbon.	Silicon.	Sulphur.	Phosphorus.	Manganese.
Soft.....	0.17-0.20	0.25-0.35	0.015-0.050	0.020-0.04	0.50-0.75
Medium.....	0.20-0.30	0.25-0.35	0.015-0.050	0.020-0.04	0.50-0.75
Hard.....	0.30-0.40	2	0.015-0.050	0.020-0.04	0.75-1.00

The attainment of such objects is brought about by adjustments of chemical compositions during the process of refining the raw material and also by certain methods of heat treatment applied to the finished product. Steel castings are divided into three grades: "soft," "medium," and "hard." Standard specifications do not define the chemical composition of each grade but give attention mainly to the physical properties as cited in the preceding pages. Generally stated the figures given in Table I will cover the composition of each class of castings.

Tensile strength is understood as the resistance of a body to a stretching force steadily applied. And the force necessary to produce a rupture is expressed in pounds per square inch of section.

Ductility is that property which yields to a tensile stress and produces a permanent deformation or elongation with or without rupture. It is expressed in "percentage of elongation" and is measured between two predetermined points. It may also be indicated by the contraction of area when a specimen is measured, before and after the fracture in cross section. Not only will a specimen increase in length under a certain stress but at one point it will decrease in area so that upon fracture there may be a distinct "necking" and the rate of increase in sectional area is expressed in "percent-

age of contraction," which together with the measured elongation can be regarded as indices of ductility.

Elasticity is the ability of a body to resist or yield to a tensile stress without a permanent deformation, or in other words assume its original dimensions when the stress is released.

Elastic-limit is that point where a permanent deformation under a load begins or where a specimen fails to assume its original length or sectional area when the load is released. This definition can also be applied to describe the arrival of a "permanent set." The determination of elastic limit is a delicate one and in engineering problems is very important, representing the practical value of a casting. In making calculations for service loads the elastic limit of the metal entering into castings is taken as a basis, not the tensile strength. For general purposes 50 per cent of the ultimate or tensile strength is taken as the value of the elastic limit. An increasing ratio between elastic limit and tensile strength is a prime object to reach in high grade products.

Hardness is understood as the property of a body to resist the static penetration of another harder body, or it may mean the ability to resist attrition caused by the movement of another harder body.

Unfortunately there are not known any precise data as to the influence of carbon in steel castings upon the tensile strength and ductility of the metal in them. The influence can only be stated in general terms in the light of practice. To get exact values would entail different researches; it would be necessary to have conditions fixed in order to study the influence of successive increments of the element. The furnace practice, casting temperatures and heat treatment would have to be constant in each case for strict comparisons. The contents of silicon, sulphur, phosphorus and manganese would have to be subject to definite control with only variations permissible in the carbon of each specimen before reliable information could be deducted. Experience has proven as a recognized fact that carbon is both a hardening and strength giving agent. Reference to the physical requirements of the three grades of castings and their corresponding chemical analyses will bear out the general assertion, but owing to other disturbing influences, more or less potent, the ranges of analyses are not concordant with the tensile strength and ductility for each class. That is, it is indefinite that a 0.17 to 0.20 carbon may show about 60,000 pounds per square inch, and a given elongation and contraction. As the carbon increases there are gains in strength but decreases in ductility in the remaining grades. Campbell in his admirable work on the "Manufacture and Properties of Structural Steel," gives formulas for the calculation of the physical properties on the basis of chemical composition and in a later treatise [1] revises them giving values for several elements common to steel, making a distinction between acid and basic practice. His figures apply to *rolled* material produced under fairly regular conditions, but it would seem inconsistent to apply the same formulas to steel castings manufactured under totally dissimilar methods. Kent [2] quotes Webster giving values of carbon in rolled stock in conjunction with three other elements: Sulphur, phosphorus and manganese as a constant of 800 pounds per square inch with each 0.01 per cent of that element with a base value of 34,750 pounds per square inch for carbonless wrought iron. Prof. H. M. Howe [3] shows that the hardening power increases with the carbon content and also roughly plots a curve giving a direct increase in strength varying with the carbon until a point is reached near 1.20 per cent when the strength or tenacity rapidly decreases with a further gain in carbon up to three per cent, where the

[1] Journal British Iron and Steel Institute, No. 2, 1904, pp. 21 to 62.
[2] Mechanical Engineers' Pocketbook, 1904, p. 389.
[3] Iron and Steel and Other Alloys, 1903, pp. 192 to 162.

strength then remains fairly constant up to 4.50 per cent of that element. The maximum strength at 1.20 per cent being about 140,000 pounds per square inch falling to about 25,000 pounds at

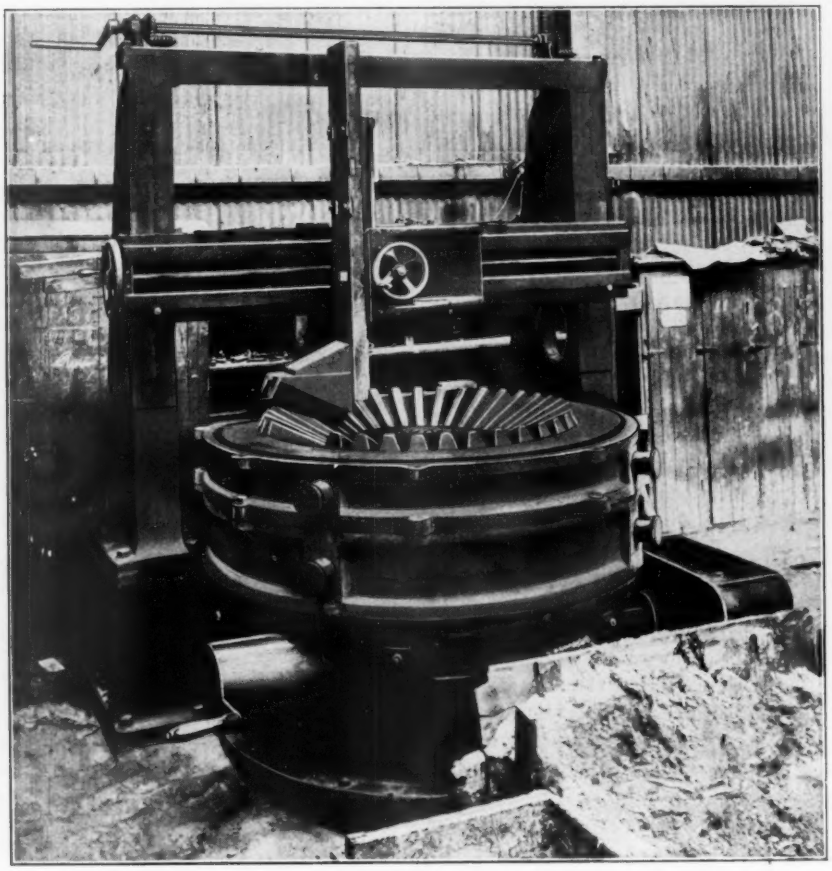


FIG. I.—MACHINE FOR MAKING GEAR MOLDS.

three per cent and at 4.50 per cent to about 18,000 pounds. Campbell [4] assumes a base value of wrought iron as 38 to 39,000 pounds per square inch and constructs formulas for both acid and basic steel compositions with 0.01 per cent carbon giving 1,210 pounds per square inch for each point gained in the first named grade and 950 pounds per square inch for each point of carbon in the latter grade, but which, as already stated, apply only to rolled material. In steel castings the disturbing factors are so numerous that it seems impossible to formulate precise mathematical computations covering the physical properties, taking into account the composition and values of each element. The furnace practice is perhaps, the greatest factor entering into the equation and since no two heats are handled exactly alike in all particulars the problem becomes more and more abstruse. Character of stock, flame action, oreing, casting temperatures, recarbonizing and the methods of doing the same, rate of cooling in the sand, either in dry or green sand molds, all need consideration as do methods of heat treatment, leading one into a maze of speculation. General terms, therefore, cannot be avoided. Certain authorities have been cited and the reader is at liberty to form his own conclusions as to which

[4] Manufacture and Properties of Structural Steel, 1896, p. 329.

can or may be followed in attempting to give a value to carbon and its influence upon open-hearth steel castings.

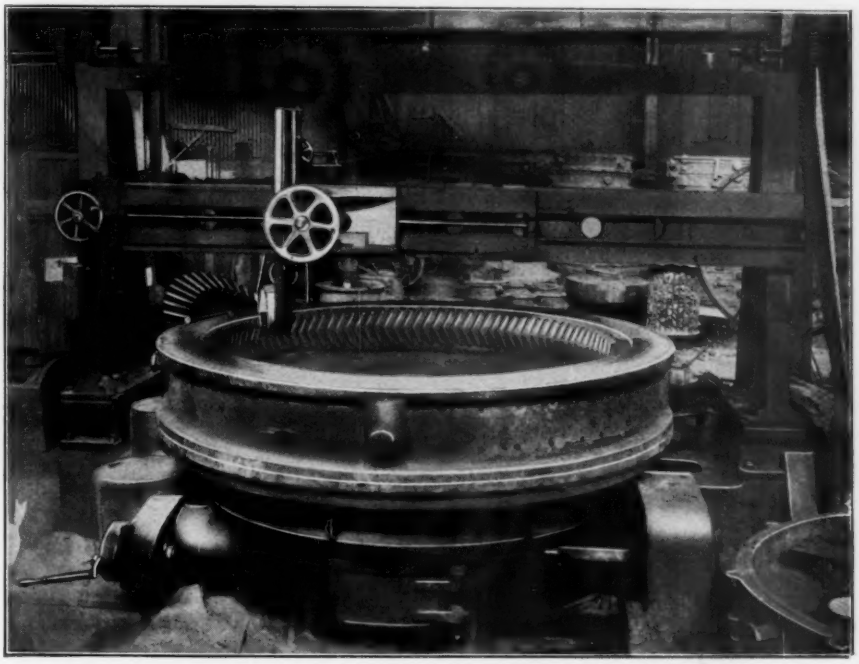


FIG. 2.—GEAR MOLDING MACHINE MAKING HERRING-BONE GEAR TEETH.

MACHINE MOLDED CAST GEARS.

For heavy duty, such as is required in rolling mill service and the main transmission gears in some other lines of manufacture, it is necessary to have not only very strong gears, but also gears which will feed accurately. If a gear is so rough that one tooth takes all the work that should be distributed over two or three, the high tooth is practically sure to be broken, no matter what material the gear is made of. Hence, for this class of work, the two essentials are accuracy in the workmanship and strength in the material. The gears used in rolling mills are subjected to exceedingly violent shocks, as the engines are reversed or as blooms enter or leave the mill. Cast iron cannot be used for this purpose, for even high grade air furnace metal has not sufficient strength to resist the constant shock. This is especially true when a gear is partly worn out. Gears for this class of service must be made of material which is not only strong, but which will wear for a maximum length of time. Cut gears have been used in some cases, on account of their great accuracy, but there are several objections to this class of transmission machinery: First, the expense of a cut gear is very great, especially in the case of large work; second, the cutting of teeth in a heavy rim often exposes serious blow holes, which weaken the teeth greatly. This is due to the fact that it is difficult to cast a sufficiently large plain rim to machine teeth from, and, at the same time, insure a solid casting, free from shrinkage or blow holes. When the teeth can be cast accurately to form, there is an advantage, arising from the fact that the metal solidifies from all surfaces, and hence is densest near natural surfaces. The projecting teeth usually solidify clear through, and if there are any blow holes, they will be located in the rim below the roots of the

teeth. This insures sound, dense metal in the teeth, giving maximum strength and maximum life or resistance to wear.

There are several difficulties which arise with the attempt to cast accurate gears: First, the making of accurate patterns for the entire gear is an expensive proposition, while if the gear is cast in cores which are arranged in segments, each core containing several teeth, the unequal shrinkage of the cores in drying is sure to result in a distorted gear. This distortion destroys the accuracy of the pitch, and results in excessive wear on certain parts of the gear. These difficulties are very effectually overcome by the patented molding gear machines used in the plant of the Mesta Machine Co., at West Homestead, Pa.

FIG. 3.—CORING UP A LARGE GEAR MOLD.

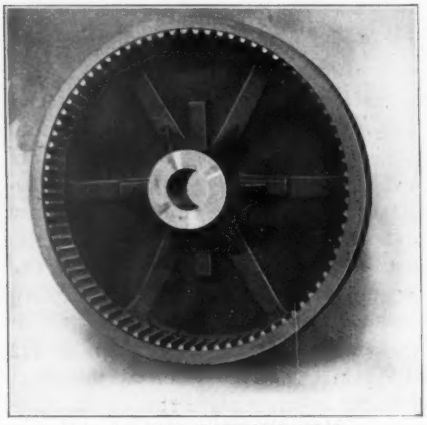


FIG. 4.—CAST INTERNAL GEAR.

At the first glance, one of these machines looks like a boring mill. It consists of a suitable table which is rotated by an index mechanism. Above the table is supported a cross rail carrying a head upon which the templates or patterns are supported. This is very clearly shown in Fig. 1, which illustrates the use of this machine for making a bevel gear mold. An ordinary steel flask is first rammed up in the usual manner, a spindle stepped in the center and a bed struck off corresponding to the base of the tooth. The only pattern necessary consists of two accurately formed teeth. These are properly spaced on the machine, lowered upon the bed already referred to and molding sand rammed between them, thus forming the portion of the mold corresponding to the space between the two teeth in the gear. The template is then raised, the table given a partial rotation by means of the index mechanism and the template lowered in the proper position for ramming the next tooth. In this way, each tooth is accurately rammed in its correct position, and the spacing must be uniform, as it is determined by an accurate index mechanism. Any form of tooth can be con-

FIG. 6.—CORING UP A SMALL GEAR MOLD.

structed, provided the template will draw off from the tooth, and spur gears, bevel gears or herring-bone gears can be made successfully on the machine. A larger machine of the same type engaged in making a mold for a herring-bone gear is shown in Fig. 2. The difference in expense between making an entire pattern and the having to make only one or two teeth will be appreciated by all foundrymen.

Then, too, the matter of storage of large gear patterns is an exceedingly difficult problem, while, with the use of the molding machine, only the teeth or templates have to be stored, and these do not take up much room.

Fig. 2 clearly shows the line of demarkation between the sand backing first rammed into the flask and the facing sand rammed between the teeth. It will be noted that the latter is new, strong sand, while backing sand is made up largely of heap sand.

After the molds have been made on the machines, they are taken to a suitable drying oven and baked. The arms and interior of the rims are then formed by means of cores.

Fig. 3 shows a large gear mold being cored up. Two of the cores forming the inside of the rim have been placed in position, but the cores for forming the arms have not, as yet, been set.

FIG. 5.—CAST WORM GEAR.

The step for the spindle for sweeping up the seat for the cores can be plainly seen in the center of the mold. The coring of the smaller gear mold is shown in Fig. 6. The arms in this case are formed in the cores, and the core for the hub is placed in the center. Such a mold as this would be pored by a suitable gate on the hub.

iron plates, upon which the castings are placed. Between the bottom of the plates and suitable cast runways in the floor, there is a series of 5-inch iron balls. When the castings have been placed upon the trucks, they are run into the oven, the door closed and the temperature raised until the casting is at a dull, red heat. Steel

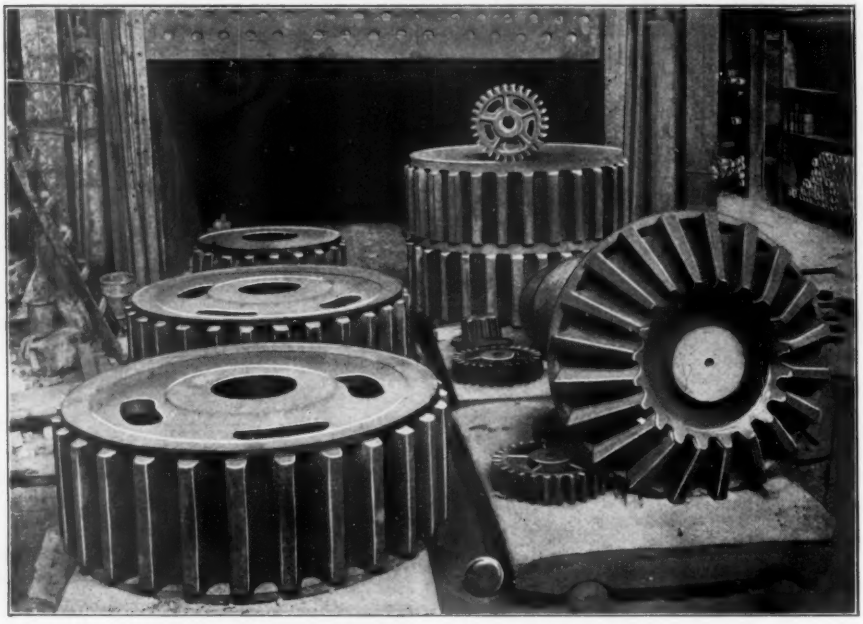


FIG. 7.—ANNEALING OVENS FOR GEARS.

One thing that is worthy of attention in this illustration is the especially heavy, rigid rigging used by the Mesta Machine Co. in their foundry. It will be noted that the flask is made up of steel castings, and that it is heavily ribbed, so as to enable it to resist any strain that may be brought to bear upon it. Good rigging costs money, but is very efficient in the production of good work. After the castings have been poured and taken from the mold, they are liable to contain serious strains, due to the form of the work and to irregular cooling. To overcome this, the gears are all annealed before being shipped from the foundry. Fig. 7 shows one of the annealing ovens with the trucks drawn forward. These trucks consist of heavy

castings have a certain critical point, known as the recalescent point, at which crystallization takes place. If the steel is heated just above this point, all previous crystallization will be destroyed, and upon cooling the piece, it will have a fine, dense grain structure. If the work is heated too far above the recalescent point and then cooled, it will have a coarser or more open structure, due to the formation of crystals or a crystalline structure, as the work cooled to the recalescent point. This point or temperature depends upon the carbon content of the steel, and upon certain other factors. A knowledge of these factors is necessary to enable the manufacturer to turn out work of uniform quality.

From the foregoing, it will be seen that the annealing has a two-fold object, the first being to remove strains and the second to improve the structure of the metal, which will increase its strength. After the castings have arrived at the proper temperature, the oven is sealed up and allowed to cool slowly for several days, when the work is drawn out.

The investment necessary for equipment to carry on this heat treatment is very great, but it enables the manufacturer to turn out a uniform product.

Some of the possibilities of machine molded gears are shown in Figs. 4 and 5. Fig. 4 shows a large internal gear which was made on one of the molding machines shown in the previous illustrations, while Fig. 5 shows a worm gear made in the same manner. The man standing at one side will give an idea of the size of this casting. Many of these large gears are made for use in connection with the machinery manufactured by the Mesta Machine Co., though many are sold to other manufacturers to be used in connection with heavy machinery turned out in connection with rolling mill equipment and subjected to very severe service.

THE STUDY OF MOLDING SANDS.

In connection with the elaborate paper by Prof. Ries, of Cornell university on the "Laboratory Examination of Molding Sands," read before the Cleveland convention of the American Foundrymen's Association, and published in our July issue, we are requested to give publicity to the following questions which Prof. Ries would like to have answered by those of our foundrymen and sandmen who have given this subject some attention. Kindly address replies to Prof. Heinrich Ries, Cornell university, Ithaca, N. Y., or to THE FOUNDRY.

1. Are the sizes which I used in the several tests sufficient or would it be desirable to include a ten-mesh size?

2. Is it really worth while making a chemical analysis of a molding sand since molding sands used for different purposes do not necessarily vary in their chemical composition?

3. It has been argued by some that a calcareous sand (containing lime) is undesirable and yet I give the analyses of two which are being used and it is claimed, with satisfaction. It is not necessary to run a complete analysis in order to determine the calcareous nature of a sand for a drop of muriatic acid will tell us at once whether the sand is very calcareous.

4. Are the fire tests on the compressed sand cubes of any practical value?

5. If any of the foundrymen can suggest a good test of the bonding power of sand I should be glad to have them do so. At present the simplest test is to mold the sand up into bricks in the same shape as those for testing cement, and measure the amount of pull it takes to break them in two. Some sands have so little cohesiveness that it is difficult to carry out this test.

TRADE PUBLICATIONS.

Frederic B. Stevens, Detroit, Mich., has issued a very neat catalog, 6 x 9 inches, containing over 220 pages. This is one of the most complete foundry supply catalogs which we have seen and certainly shows a very fine line of equipment for all classes of work. It contains a description, not only of foundry facings and foundry supplies, but of polishers' and platers' supplies.

"The Fable of the Foundryman Who Was Willing to Be Put Next" is the title of a clever little pamphlet being sent out on application, to foundrymen by Rogers, Brown & Co., Cincinnati.

GENERAL INDUSTRIAL NOTES.

The sale of the Diamond State Steel Co.'s plant, Wilmington, Del., has been ordered by federal court authorities.

W. H. Kellogg has just completed a foundry plant at Sebewaing, Mich., and is now prepared to furnish gray iron castings.

BRASS FOUNDING

THIS DEPARTMENT IS DEVOTED TO THE TREATMENT OF ALL ALLOYS INCLUDING THEIR

FOUNDING, GRINDING, POLISHING, ELECTROPLATING ETC.

PRACTICAL ALLOYING, VIII.

BY JOHN F. BUCHANAN.

Fluxes for Alloys.

Fluxes are the reagents of the smelter and the proper use of fluxes is of the highest importance in the production of metals from the ores. Most fluxes act both chemically and physically; they are acid or basic according to the oxygen ratio of flux and gangue. Acid fluxes (mostly silicates), are employed to act upon basic materials and vice versa. Alkaline fluxes are chiefly used in refining metals. In the foundry where only refined metals are used there is not the same scope or necessity for using fluxes.

Many of the neutral fluxes (so-called) act simply as protective coverings to the surface of the metals in the process of melting. Charcoal, coke dust, lamp black and such highly carbonaceous bodies give excellent protection in the reduction of brass and gun metal alloys. In charging the crucible the very first ingredient should be a handful of charcoal or coke dust; then as the metal melts and rises in the crucible the surface of the bath is protected from the oxidizing influence of the atmosphere. In this way the true character of the alloy is maintained, whereas by careless treatment, overheating or prolonged melting in contact with the fuel and products of combustion, the best of metals may be rendered worthless.

It is worthy of note that metals which are cast always show their natural defects in the casting, but metals which undergo mechanical treatment, as rolling, forging, etc., may have similar defects entirely removed or at least remedied by the process.

All the good work that can be put into a casting should therefore be done before the metal enters the mold. The preparation of alloys for casting requires greater precautions than are necessary in the case of simple metal, and the difficulties increase with every added component, unless there is chemical affinity to assist in the combination.

Even with the most careful melting the metals are partially oxidized and gases are occluded or absorbed. To free the metal from these oxide compounds and gases in solution, fluxes capable of redissolving the oxides and removing the gases are introduced. In some instances it is also desirable to remove foreign metals known to be present in the alloys as impurities.

Of course, if old metals are used many more impurities are liable to be introduced than with new metals. Scrap brass has always some impurity clinging to it,—grease, paint, sand, solder, red lead, cement, etc., and the effect of these contaminations is to deteriorate the physical properties of the metal.

A suitable flux may to a large extent remove the dross and counteract the baneful effects of the impurities, but if uniformity is desired in an alloy as a regular product, scrap metals and their attendant faults and fluxes should be barred. Following is a list of the most common fluxes for alloys:

For brass:—1. Potass carbonate = pearl ashes mixed with damp sawdust.

For brass:—2. Pot. sulphate = sal enixum. mixed with charcoal.

For brass:—3. Salt cake = crude sod. carb. five parts. silica = white sand 15 parts, coal dust = anthracite five parts, bone ash = 20 parts.

Mix, cover the surface of the metal, stirring it in before bringing to a heat.

For gun metals:—4. Equal parts crude tartar and nitre burned together.

For gun metals:—5. Sodium chloride = common salt, is a useful flux in reverbatories. It forms a fusible compound with antimony and arsenic, thus removing these undesirable elements from the alloy.

For gun metals:—6. Nitre, three parts; argol, two parts. Recommended by T. D. Bottome.

For gun metals:—7. Silica. Great hardness and ductility may be given to red brass, without having recourse to phosphorus, by mixing in with the other metals, two per cent of finely powdered green bottle glass, placing it at the bottom of the crucible. If the alloy is for parts of machinery and to be tooled add one per cent manganese deoxide (MnO_2). The metal is rendered very fluid and close-grained.

For babbitt metals:—8. Sal ammoniac (ammonia chloride). This substance is decomposed by the metals at comparatively low temperatures, forming metallic chlorides and liberating free ammonia.

For babbitt metals:—9. Tallow or fat of any description and rosin. These substances ignite and liberate gases which unite with the contained oxygen, thus acting as reducing agents on the metallic oxides.

For brazing metals:—10. An improved flux consists of boric acid and sodium carbonate in equal parts. This is used instead of borax. It does not intumesce like the latter.

For aluminum alloys:—11. Benzine, resin, cryolite. Fluxes proper are to be avoided with aluminum, especially sodium compounds; they injure the alloy by dissolving the walls of the crucible and introducing infusible silica and iron compounds. Overheating is a prolific cause of trouble with the light alloys.

For nickel alloys:—12. A special nitre equal parts to be stirred in five minutes before casting.

For nickel alloys:—13. A special flux for German silver consists of silica sand, three parts; ground marble, five parts; borax, one part; salt, one-half part; mix with an equal quantity of powdered charcoal.

For brittannia metals:—14. Stearic acid heated and applied to the mold is a preventive for faintness in fine chilled castings in soft alloys.

For brass sweepings:—15. Mr. E. S. Sperry speaks highly of plaster of Paris ($CaSO_4$) as a flux for reducing brass ashes, skimmings, buffings and grindings. Such finely divided particles are generally productive of more dross than metal if melted in the ordinary way. This is a cheap and thoroughly efficient flux.

For copper:—16. The purification of copper has received considerable attention. Zinc oxide and charcoal added to molten copper is helpful in producing sound copper castings. These substances are mixed with molasses water to a stiff paste, formed into balls and dried. When the copper is just melted one of the balls is dropped on the surface; it covers the metal and the zinc in the mass combines with any oxygen present. Silicon copper is the best deoxidizer for cast copper, but it comes under metallic fluxes.

For copper alloys:—17. The following mixture for improving copper alloys was the subject of a patent. Iron peroxide, 33 parts; manganese peroxide, one part; magnesium carbonate, one-half part; alum, 18 parts; silica, 3½ parts; borax, four parts. Mix and stir well into the metal.

From the foregoing it may readily be believed that there is no lack of variety of fluxes for alloys, at the same time it cannot be too strongly enforced that the duty of a flux in foundry practice is to purify the metal without entering into combination with it. Such a flux is not easily obtained and some of those here given are open to serious objection because of their corrosive action on the linings of ladles and crucibles resulting in the loss of metal in forming slag and in some cases adding new forms of impurity to the metal treated.

In the refinery, fluxes are essential to liquify and dissolve away refuse matters associated with the metals, and their effect as solvents may generally be stated in the terms of an equation, but in the foundry where only finished metals are dealt with, oxidation is the one thing to be guarded against.

In recent years the deoxidation of alloys by means of metallic additions has become universal. Much of the excellence of our modern alloys is due to small additions of elements which to some extent form chemical combinations with the mixture. We have already admitted that the chief use of a flux in foundry practice is to remove certain faults introduced with scrap metals. Now, it seems that object can be attained, and the alloy improved, by the use of some metallic flux (?), with greater ease and certainty, than by the application of salts and radicals enumerated above.

These "tempering metals," as they are now called, require to be used with judgment. Most of them might be called concentrated alloys. They include:—Phosphor copper = 10 to 20 per cent P. Phosphor tin = five per cent P. Phosphor aluminum = five per cent P. Cupro-manganese = 30 per cent Mn. Ferro-manganese = 25 to 50 per cent Mn. Ferro-aluminum = 10 per cent Al. Ferro-zinc = five per cent Zn. Aluminized zinc = Al and P two per cent. Silicon-copper = 15 per cent Si. Arsenic lead = two per cent As. Antimonial lead = 20 per cent Sb. Magnalium = 2 to 10 per cent Mg, 90 per cent Al. Zinc-aluminum = 3 to 33 per cent Zn.

The use of these specially prepared, and in most cases, concentrated alloys, has advanced very rapidly in recent years. Phosphor copper and phosphor tin were amongst the first of the new tempering metals to be used for fluxing or to impart special properties to alloys. The vigorous purifying effect of these phosphides on bronze are well known and appreciated, but the most important feature in this, as in most of the newer improvements in alloys, lies in the fact that the structure changes, pointing to a condensation of the alloy, and giving increased density, tenacity and fusibility.

For many years phosphorus was the cure-all of the brass founder. It livened up dull metal by dissolving the cuprous oxide which forms so readily in copper alloys; it also increased the utility of lead in brass and gun metals and it was supposed to turn old inferior metals into castings of just as fine appearance and as good practical value as could be obtained from new metals.

On this supposition the mistake was often made of adding an excess of phophorus. It was a fatal mistake. Phosphorus is a weakening element in any alloy if it remains in solution. For this reason only so much as may be necessary to reduce the oxides and remove impurities, generally from one to five per cent, is desirable to flux brass or gun metal alloys; while as a tempering agent in bronzes the content of phosphorus should in no case exceed two per cent.

Owing to the commercial production of these tempering metals in definite proportions it is an easy matter to combine the exact quantities of the "temper" desired.

Next to phosphorus aluminum is the most popular flux or tempering metal for casting alloys. For some years past it has been quite the rage. But it also has proved a dangerous element when it has been used indiscriminately.

Phosphorus is most beneficial in copper-lead alloys, and least active in copper-zinc alloys; aluminum on the other hand is positively harmful in copper-lead mixtures and most effective in strengthening copper-zinc alloys. The subject of metallic reactions is one which deserves the fullest investigation and the active properties of aluminum in metallic combinations are specially interesting.

I am quite convinced that the writer of the advertisement for the New Era Mfg. Co. knew something when he penned this. "It (Al) operates to increase the chemical affinity between the different elements of the mixture and tends to DETERMINE the copper or

higher colored elements to the surface." That statement alone did not carry conviction; but my own experience and the knowledge of a secret process by which a cast iron alloy with copper and aluminum could be made to produce castings having the appearance of brass led me to the conclusion that aluminum could either precipitate the copper or alloy with the copper, and because of its low specific gravity and high specific heat this copper-aluminum alloy appeared on the surface of the casting.

The value of aluminum in brass alloys is unquestioned. It increases the tenacity of brass by more than one-third and gives a closer grain and a higher color. It reduces the corrosive power of the atmosphere on brass and it is an economical mixer in quantities from 0.5 to 4.0 per cent. The best method of combining the aluminum is in the form of aluminized zinc.

Manganese is another splendid deoxidizer for copper alloys. Metallic manganese is hard to reduce, therefore an alloy of copper and manganese is the best medium for introducing the "temper." Usually about two per cent Mn is added to the ordinary alloys. Ferro-manganese, ferro-aluminum, and ferro-zinc are frequently used in the production of manganese bronzes and sterro metals.

Certain metals are known to react upon each other in the heat to promote fluidity, as silicon, phosphorus, aluminum, and manganese in copper alloys, hence, the special preparations silicon-copper, etc., have come to be regarded as metallic fluxes in the brass foundry.

But the element which approaches nearest to the action of a flux is arsenic because it promotes the union of metals that would otherwise be difficult to mix. Arsenic bronze, now used for railway brasses, is a good example. The compositions average: Copper, 80 parts; tin, 10 parts; lead, 10 parts; arsenic added equals eight per cent. Arsenic is also useful in helping to carry a higher percentage of lead in zinc alloys.

The fluidity of metals is very variable, and as a general rule the fluidity of alloys is greater than that of the individual metals. Zinc or copper melted by themselves are comparatively sluggish, whereas brass, the alloy, is a very fluid metal. Zinc alloyed with antimony is more viscid than plain zinc, while an alloy of copper, and antimony is remarkably fluid. Aluminum has better flowing power when barely melted than at higher temperatures, but immediately when it is alloyed with some other metal this characteristic loses force.

Instances could easily be multiplied showing that small additions of metals in alloys,—so small as not to class them as alloying metals—have the same purifying effect as have fluxes proper upon ores. Such metallic fluxes have generally sufficient affinity for oxygen to combine with or else reduce the dissolved oxides in the molten alloy and the chemical reaction liberates gases which either raise the temperature by a definite amount of sensible heat or lower the melting temperature of the alloy. Homogeneous metals result and in many cases the physical properties of the alloys are improved in a degree not otherwise obtainable.

So long as scrap metals are a part of the mixture, (and there is no other practical way of using them up) fluxes, whether metallic or neutral, must find a place in foundry practice, to act as cleansers or as aids to the closer union of the components. Very few of the alloys can be melted without decomposition and no metal is exactly the same physically after it has undergone heat treatment. Fluxes are therefore essential to modify the defects of every-day melting practice and of all the fluxes in use the metallic preparations are the most convenient, only, they must be used with moderation and in their proper spheres of influence.

MIXTURES FOR CHANDELIER WORK.

Inquiry.—Will you please furnish me with a first-class formula for chande-

lier work, also a cheap mixture for the same class of goods?

Answer.—The most modern designs for chandelier work have brass, wrought iron and copper in combination. Brass is generally the foundation of the color scheme and many plain and ornamental castings are necessary for the completion of the design. The whole of the work is lacquered when it is finished: for the most part it is left bright but sometimes the plain parts are bronzed and relieved at suitable places by burnishing. Castings for the latter are usually made from the ordinary yellow brass, two and one alloy.

For the finer ornamental work which is to finish bright and dipped in acids to heighten the effect of ornamentation and color contrasts, only "dipping" metal, or fine brass alloys may be used. Such alloys range in copper from 70 to 85 per cent and zinc from 15 to 30 per cent. The higher the percentage of copper the deeper the color of the brass and if a paler color is required than can be had with only copper and zinc in the mixture, from one to three per cent of aluminized zinc may be added to the last named quantities.

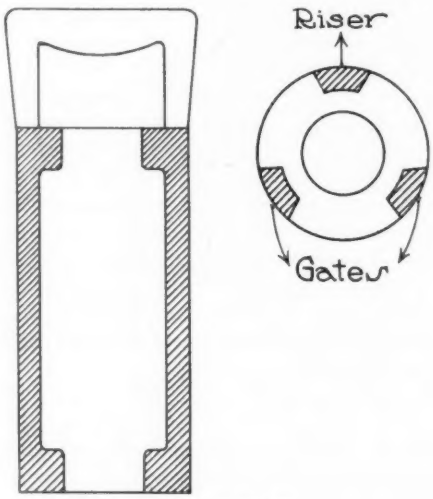
Small additions of any metals having a tendency to harden or close the grain of the alloy will give a higher polish with the burnisher. Nickel, manganese, aluminum, tin, arsenic, phosphorus, have each this effect, but with the exception of aluminum, not more than 0.5 per cent should be present in the alloy. On the other hand the presence of such impurities as lead, iron or antimony, would be fatal to a brilliant finish in the dip. The main point therefore in making a successful dipping metal is to use only the purest metals that can be had. Remelted zinc will not do for a first-class dipping mixture; it always contains the impurities mentioned. Two first-class mixtures used by Birmingham (Eng.) founders are: 1. Copper, 19 pounds; zinc, six pounds. 2. Copper, 30 pounds; zinc, 12 pounds; tin, ¼ pound.

A brass mixture for dipping can only be cheapened by increasing the proportion of zinc and a large class of decorative work is run with mixtures containing from 7 to 14 pounds of zinc to every 16 pounds of copper,—that is to say, the cheaper dipping metals show from 30 to 47 per cent zinc while the finer qualities have only 16 to 28 per cent.

J. F. BUCHANAN.

GUN METAL ROLLS.

Inquiry.—We are having trouble in making rolls 48 inches long and 12 inches in diameter with a 7-inch core. The rolls weigh about 1,000 pounds. When a cut is removed from the casting we find them to be porous. The castings are made in dry sand and the molds perfectly dry. The metal used is one part of tin to eight parts of copper. We have mixed the core sand with one of flour to ten of sharp and molding sand. The metal seems to go right through this core. During casting and for about five or ten minutes afterwards, we notice a bubbling in the core, which we think is the cause of the porous condition. Can you suggest a remedy?



GUN METAL ROLLS.

Answer.—The fault is evidently due to the core mixture. Flour and sharp sand are not capable of resisting the searching powers of a rich copper-tin alloy in heavy masses. Why should

you make a sand core when a better and a cheaper core can be run up in loam? If it is not convenient for you to have a loam core you must change the core mixture. Mix ten parts rock sand (that is the sand you use for the dry sand mold), one part sharp sand and one-half part plumbago facing with thin clay wash. Keep this for the outside of the core only. After lining the core box with this to a depth of two inches all around the circumference, fill in the remaining space with your ordinary molding sand and vent with ashes. Although the outside of the core may appear to be of a very close nature you need have no fear about it blowing, provided it is thoroughly dry. Give the core two coats of plumbago wash and finish with gum water.

It is quite possible that these castings would come out porous even if the metal did not penetrate the core. Had you explained your method of casting the remedy might have been stated with more certainty. If you are not tied to the specified mixture you might add from six to ten per cent of ordinary steam metal with advantage. Do not cast the metal too hot; there is a good thickness all around and the hotter you pour this alloy the more liable it is to liquate. The result would be a porous casting such as you complain about. No doubt you would observe that the metal which "burned" through the core was high in tin, due to liquation. It is difficult to prevent this, but if the metal is remelted, or if two per cent zinc or the steam metal indicated above is added, the liquation would be reduced. Cast in the vertical position as shown and have the runner basin made so that it can be kept full shortly after you start pouring. An extra half inch per foot should be allowed on the top end for a "head."

J. F. BUCHANAN.

THE CIRE-PERDUE PROCESS AT THE ROMAN BRONZE WORKS.

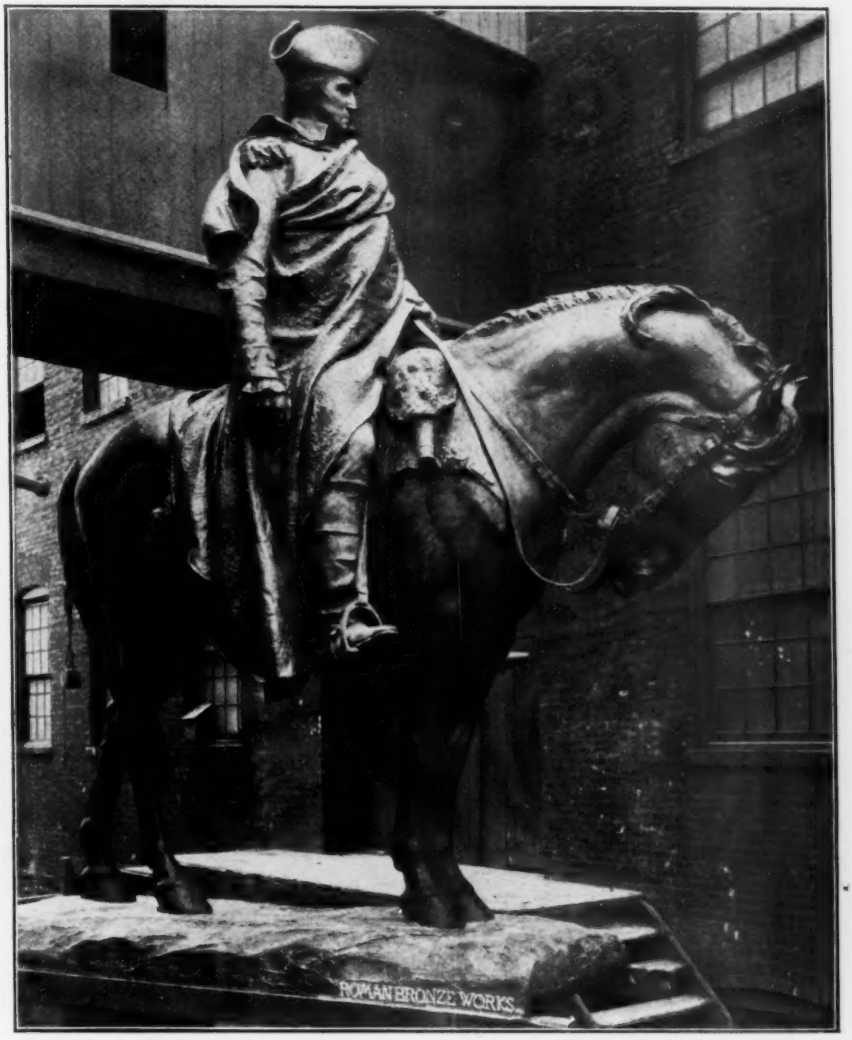
A foundry in which one can find neither flask nor pattern nor sand pile looks like a very queer place to the molder familiar only with the usual methods. Yet such a foundry not only exists but flourishes and gives steady employment to between sixty and seventy men within the boundaries of Greater New York. The Roman Bronze Works at Greenpoint — about a mile north of the Brooklyn navy yard—which turns out some 75 tons of artistic bronze castings per year, makes use of the "cire-perdue" process exclusively and therefore has no need of flasks, nor of many of the other necessary paraphernalia of the ordinary foundry.

The "cire-perdue" or "lost wax" process differs in certain essential features from the usual method of casting in sand molds shaped by pressure and tools, for the molds are also cast, not of metal but of a semi-liquid composition of which plaster of Paris seems to be an ingredient. The mold is cast and allowed to harden around an exact reproduction in wax of the object desired, to which has been attached the necessary gates and vents of the same material. After the whole mass has hardened sufficiently it is transferred to an oven and heated until all the wax has been melted or burned out leaving a mold ready for the metal.

The process is not new. In fact it has been used in Europe for hundreds of years and a crude form of the method was employed by the ancient Greeks and Romans. Benvenuto Cellini, the great bronze worker of Florence, Italy, developed it to the present state about the middle of the sixteenth century. Its use on a large scale was introduced into this country about ten years ago by the proprietor of the Roman Bronze Works and that foundry is the only one in the United States in which the process is now employed.

Of course the "cire-perdue" process cannot compete with the ordinary sand process in the production of machine or industrial castings, for the waste of material is considerable. The molding material can be employed only once, and for every casting produced an equal bulk of wax is de-

THE CASTING ROOM, ROMAN BRONZE WORKS.



WASHINGTON AT VALLEY FORGE.

stroyed. But in the production of statuary and complicated art designs in which cost is not the prime consideration it possesses a number of advantages. No matter how complicated the design may be, whether it be a wreath of leaves and flowers with a hundred undercuts or the figure of an animal, it can be cast in one piece, size permitting. There is no tamping in the mold with the danger of destroying details and the process takes only about half as much time as the other. The mold material gives the details of the wax figure with marvelous clearness, even thumb marks appearing to the last line, and no facing of any kind is required.

The lastest notable piece of work turned out by the Roman Bronze Works is a heroic equestrian statue of Washington, modeled by the sculptor, Henry Merwin Shrady and unveiled at the Brooklyn terminal of the Williamsburg bridge on June 16. The completed bronze piece weighs about 15,000 pounds. Owing to its great size it was cast in eight pieces, the largest of which weighed two and one-half tons. The statue was modeled of full size in plaster by the sculptor and the model taken to the foundry in sections.

THE FINISHING ROOM, ROMAN BRONZE WORKS.

The first stage of the process after receiving the model consists in preparing a negative in plaster. This is merely a cast of the outside of the model. In this negative which shows all the details of the model in reverse the wax pattern is built up by hand. The wax is first applied in a molten state with a brush but after the coating has acquired sufficient thickness to protect the most delicate lines, the wax is applied in sheets and pressed into place with the hands. As the wax pattern has the exact dimensions of the finished casting great care is exercized in apportioning the material according to the amount of metal required. The thickness varies from a quarter to three-fourths of an inch depending upon the size of the figure.

The wax is sufficiently hard to permit handling and can be retouched by the artist as much as he pleases. Gates and vents in the shape of wax rods are then attached to the figure, bronze rods inserted to serve as chaplets and, if necessary, openings cut to permit the core material to flow into the shell. Finally the mold for the metal is formed by pouring in and around the wax a composition, practically liquid, which hardens in a few minutes.

After baking over a slow fire and cooling the completed mold is packed in sand in a pit, and the metal run in from crucibles. In the foundry of which views are here shown the bronze is melted in the usual crucible furnace fired with coke.

The molds which remain solid are broken carefully to avoid injury to the castings and the metal figures removed to the trimming room to remove the gates and channels. As the molds are all in one piece very little trimming is necessary and the work being delicate in character, everything is done by hand. Beyond brushing off the particles of adhering composition with a stiff brush the surface requires no attention, except that it is usually treated with chemicals to produce the color or "patina" so much admired by artists.

ATTACHING WAX STRIPS FOR RUNNERS.

The different parts of large pieces are joined by means of a lap joint, one of the adjoining edges being provided with a flange cast so as to engage the metal of the adjoining piece from below. Holes are drilled through the two laps and threads cut to re-

ceive bronze bolts which are afterwards cut off flush with the surface. After tooling and polishing the joint is practically invisible.

BRASS FOUNDRY NOTES

BY C. VICKERS

A WATER HEATER MIXTURE AND THE MELTING OF WIRE.

Inquiries.—First, can you give me a brass mixture suitable for a cylindrical water heater that will be close enough to successfully stand a water pressure of 150 pounds? The casting in question is about five inches in diameter, 20 inches long and ⅛ inch thick. Would like mixture to be as cheap as consistent with efficiency required.

Second, we recently bought a job lot of light copper electric wiring from which the insulation had been removed and thought to use it in place of ingot metal. We used from 15 to 20 pounds of this wire, 1½ pounds tin and 75 pounds red brass scrap (valves, etc.) and our own gates in our mixture. Our metal began to run dirty and the castings leaked badly. What caused it? Is there any deterioration in the quality of copper that has been used for electric purposes?

Answers.—First, try one of the following alloys.

(1) Copper, 64 pounds; tin, four pounds; zinc, four pounds; lead, two pounds; and silicon copper, three ounces.

(2) Copper, 55 pounds; zinc, ten pounds; lead, five pounds; silicon copper, four ounces.

Do not imagine the silicon copper is superfluous. Do not leave it out because you may not have it on hand. Get it before trying these alloys. It is added after the mixture is put into the copper, and the metal should remain in the furnace a few minutes before pouring.

The above alloys are stronger and the color of castings is improved by a second melting. They can be used with scrap in any quantity. I should suggest half scrap and half new metals.

Second, there is no deterioration in the quality of copper that has been used for electrical purposes, so far as I have been able to determine, and I have used large quantities of such material, both in making brass and bronze, and for copper castings of a high conductivity. When the insulation is burned off scrap wire there is always some oxidation of the copper, to a small extent and it is unavoidable. It is from such oxide the deterioration comes and not from the passage of electricity. If the wire is coated with a reddish substance which drops off as a reddish dust when handled, the insulation has been clumsily burned off, the wire having been made red hot and kept red hot an unnecessary length of time, and is burnt. Such wire should be avoided, it will not make normal brass, and the loss from dross or oxide is heavy.

If, however, the wire is clean and ductile and there is trouble with brass made therefrom, the source of such trouble lies not in the copper wire, but in the manner of melting. To be plain about it, the melter does not understand his business and the remedy is obvious. Any one can melt down ingot copper, the metal being in a mass and ordinary care used. The air will not come in contact with as large a proportion of metal in the ingot as in the case of an equal amount of copper wire, for no matter how closely together the wire is pounded there are interstices through which the air gains access to a comparatively enormous proportion of the copper, and forms oxide, which mixes with the melted metal and is held in suspension therein. In ordinary cases the oxide is distributed throughout the metal and cannot be removed by stirring and skimming. Occasionally it happens, however, that the amount of oxide is so great that it may be skimmed off the metal like mush. Never pour metal after skimming off such mush, because the castings will be spongy.

Smaller quantities of oxide cause dirty and leaky castings. The oxide practically is dirt. It stays in the metal because copper is very fond of oxygen, each particle of copper surrounding the particle of oxide might be said to be jealous of the particle of copper that has had the good fortune to capture the oxygen, so it clings to it, living in hope, as it were, and when there is a large quantity of this oxide present in the metal the particles are carried along by the on-rushing metal and are deposited in corners and other favorable parts of the casting in such quantity that they form a pathway through which liquids under pressure easily escape, and the casting is said to leak.

When copper is cold it has no particular love for oxygen,—it does not rust like iron and waste away. It is durable and will last for centuries, but when it is heated to redness it forms oxides. When burning off insulation the wire should not be piled in one big loose pile, to make a fierce bonfire, because a big pile gets hotter and stays hot longer than a little pile, so it is best to pile them in many little heaps and fire them individually. In melting the wire should be pounded together as much as possible, and as it melts the unmelted portions must be poked down continually into the melted metal, which should be covered with charcoal.

In the case of "Inquirer," who only uses 20 pounds of wire to 75 pounds of scrap, if he melts the wire first, he will probably spoil the scrap. I should advise that the scrap be melted first, then the wire pushed into the melted brass.

A mixture of 20 pounds Cu to 1½ pounds Zn, however, run alone, cannot be expected to run solid. It should carry about one pound of zinc, or if that is objectionable, a small quantity of silicon.

BRASS TABLETS.

Inquiry:—I have a number of brass castings to make in plate form. Thickness ½ inch to ¾ inches, all sizes, up to 18 by 24 inches. The plates are covered with all kinds of lettering and designs and all the details must show on the castings and be smooth and sharp. Please tell me the best method of molding and what to shake on the molds and if the pattern should be returned to the mold. The molds must be dried or the metal will wash the lettering. Castings are bent around a cylinder for printing purposes, so please give suitable brass mixture.

Answer:—In molding these plates face all engraved surfaces with the following "facing:"

Dry new molding sand, 10 parts.
Dry old molding sand 10 parts.
Flour 2 parts.

Mix and sift through a fine sieve, then wet with water mixed with fire clay, until it is as damp as is usual with molding sand. Screen through a No. 8 sieve. The clay wash should be about the consistency of cream.

Ram up the molds as usual but do not vent. If only one surface of plate is engraved it is preferable to cope off the engraving, because the cope may then be printed, before drawing the pattern, if the design is too deep to permit of lifting in cope. The plate must be molded with the design in the nowel. All pockets must be securely nailed, and when the pattern is withdrawn, great care must be exercised in rapping not to break the sand imprint. If everything progresses smoothly the mold is well sprayed with molasses water, and thoroughly dusted with the following preparation:

Burned new molding sand 2 parts.
Plaster of Paris 1 part.

Mix, and dust through a cheese cloth bag, onto the wet surface of mold, then blow off the facing with the bellows so as to drive the dust against the perpendicular sides of engraving, repeat the operation two or three times, then dust well with lycopodium. The pattern may also be lightly dusted, then returned to the mold, and the cope closed over (we are now supposing the engraved side to be in the nowel). It is now necessary to re-ram the mold, so roll over and fix

the nowel first, remove bottom board and scoop out the sand to within one inch of the pattern, refill with loose sand and reram, vent thoroughly with a fine vent wire to within ½ inch of pattern, roll over again, lift off cope, withdraw pattern, and finish mold.

When the engraved surface of plate can be taken off in the cope, this rolling over of mold is avoided, though in casting a plate of this thickness it is best to cast the design down, so if the design is in the cope, the cope becomes the nowel, in pouring.

Do not dry such molds with a gasoline torch as it burns off sharp edges, so dry in an oven, with a stove, or a red hot plate, or over a charcoal fire, gate so the metal will not flow through the mold, and do not pour too hot.

New sand may be burned by placing in a crucible, and leaving over night in a furnace.

"Windsor Locks," "French sand" or any fine prepared facing may be used in place of the burned molding sand.

Use the following alloy:

Copper, 16 parts.

Sheet brass, 5 parts.

Tin, ½ part.

THE ESTIMATION OF MANGANESE.

BY BERNARD COLLITT, F. C. S.

Of the numerous volumetric processes employed for the estimation of manganese in iron and steel, the majority may be divided into two classes; one the Volhard method and its modifications, in which, after precipitation of the iron, the manganese is titrated with standard permanganate solution, and second those methods which involve oxidation of the manganese to permanganic acid in presence of the iron, and titration of the permanganate so formed with solution of ferrous sulphate, hydrogen peroxide, oxalic acid, or sodium arsenite. The oxidizing agents employed in this latter class of processes are red lead, sodium bismuthate, ammonium persulphate, etc.

The writer believes that H. E. Walters ("Proceedings of the Engineers' Society of Western Pennsylvania," XVII. No. 7.) was the first to adapt the oxidizing action of ammonium persulphate to the estimation of manganese in steel, the process being then put forward as a calorimetric one. H. Proctor Smith (*Chemical News,* 1904. 90. 237) describes a modified form of the persulphate method, which he claims is unsurpassed by any other volumetric method in accuracy, speed, cleanliness and cost. Hans Rubricius (*Stahl und Eisen,* 1905. 15. 890.) and H. Kunze (*Chemiker Zeitung,* 1905. 29. 1017.) confirm these claims. The former states that the values obtained agree well, and are from 0.02 to 0.03 per cent lower than those yielded by the Volhard method, or by oxidation with lead oxide in a nitric acid solution. Kunze says that the results are excellent, that the process has displaced the Volhard-Wolff method at Borsigwerk, and is now in use in many works in Upper Silesia.

The process as described by Proctor Smith is as follows:

Weigh out into six-inch by one-inch test tubes 0.2 gram of the sample and the same weight of a steel, the amount of manganese in, which has been previously determined by a gravimetric method; add from a burette 10 c. c. nitric acid (s. g. 1.20), and dissolve by heating over a small flame; boil until all red fumes are driven out of the tubes, then add 10 c. c. silver nitrate solution and about one gram of solid ammonium persulphate, dropped into the solution by means of a spatula; warm gently over the flame until the salt is nearly dissolved; then wash any salt remaining on the side of the tube down, and place in a bath of cold water. When perfectly cold the pink solution is washed into a clean porcelain dish and titrated with the standard solution of sodium arsenite until one drop turns the solution from a pinkish tinge to a very pale green. The strength of the arsenite is determined each time by means of the standard manganese steel, and thus a factor is obtained.

Silver nitrate solution: 1.70 grams in one litre; approximately centi-nor-

mal. Sodium arsenite solution (stock): Pure arsenious acid, five grams; pure bi-carbonate of soda, 15 grams. Dissolve by boiling in 250 c. c. of water. When cold dilute to one litre. For use, dilute 40 c. c. of the above to 500 c. c., when one c. c. = approximately 0.10 per cent manganese.

The following comparative results are given to prove the accuracy of the method:

TABLE I.

	Gravimetric Method, Br+NH_4OH, etc. Mn per cent	Ford & Williams, HNO_3+$KClO_3$ Mn per cent	Lead Peroxide, Comparison of Color, Mn per cent.	Ammonium Persulphate, Titration with arsenite, Mn per cent.
Cast H1241....	0.53	0.52	0.525	0.52
Cast A241.....	0.61	0.61	0.60	0.615
Cast B24.....	0.45	0.455	0.42	0.445
Blow 249.....	0.89	0.86	0.87	0.875
KB_3	0.19	....	0.18	0.185
Scotch Hematite.	1.66	1.59	....	1.63
" "	1.30	1.21	....	1.30
Bar iron.....	0.129	....	....	0.11

The writer finds that there is no necessity to check each result by the standard steel, and that the sodium arsenite solution may be standardized against centi-normal permanganate solution and then gives quite accurate results. Also, in the case of pig iron samples consisting of the mixed drillings from several pigs, it is a safer procedure to weigh out at least one gram of the sample.

The following short series of experiments was carried out to compare the method with that of Volhard, which is largely used in America and Germany. The titer of the standard permanganate used in the Volhard estimations

TABLE II.

	1	2	3	4	5	6
Volhard	0.47	0.49	0.66	0.97	1.15	2.15
Persulphate..	0.48	0.475	0.65	0.97	1.18	2.16
	.....	0.490		0.98		

was accurately ascertained by means of pure oxalic acid. The sodium arsenite solution used for titrating the persulphate estimations was centi-normal, and was standardized by means of centi-normal permanganate.

The figures in all cases are, of course, the percentage of manganese. Numbers two and four are standardized drillings of the American Foundrymen's Association, the manganese content of which is stated to be 0.482 per cent and 0.971 per cent respectively. The other four samples are pig irons. The persulphate estimations were made in the following way: Weigh out one gram of the sample into a tall 200 c. c. beaker; dissolve by the aid of heat in 40-50 c. c. nitric acid (s. g. 1.20). Boil until all nitrous fumes are dispelled. Cool, transfer to a 500 c. c. graduated flask, dilute to the mark. Transfer 50 c. c. (= 0.1 gram of sample) to a 600 c. c. Erlenmeyer flask, add five c. c. deci-normal silver nitrate solution and 200 c. c. distilled water. Place on wire gauze over the Bunsen burner. As soon as the solution boils briskly, remove from burner and immediately add 10 c. c. of a five per cent solution of ammonium persulphate; allow to stand a minute or two, then cool, and when perfectly cold titrate with the sodium arsenite solution.

GENERAL INDUSTRIAL NOTES.

The Sterling Emery Wheel Co., Tiffin, O., manufacturing emery wheels and grinding machinery, is installing new equipment which will increase its capacity 50 per cent.

The Crown Pipe & Foundry Co., Jackson, O., has increased its capital stock from $100,000 to $300,000.

The Chandelier & Art Brass Works, Richmond, Ind., has increased its capital stock from $50,000 to $100,000.

F. H. Wheeler has bought a one-third interest in the Langsenkamp Bros. Brass Works, Indianapolis, Ind., and the firm will hereafter be known as Langsenkamp Bros. & Wheeler. They will erect a large brass foundry and finishing shops.

The Chicago Foundry Co., Chicago, Ill., has been organized with a capital of $20,000. It will make a specialty of duplicate gray iron castings, soil pipe and pipe fittings. The incorporators are: A. A. Burns, M. T. Ash, E. E. Mower and E. F. McKinney.

THE PATTERN SHOP

HAWSER PIPE PATTERNS.

BY H. J. MCCASLIN.

Hawser, or "hawse" pipes, as they are generally called, are usually made in pairs, consisting of a right and left hand pipe. The length of the pipe, its diameter, and the angle of the ends, are governed by the angle upon which the pipes are set with the deck, by the outlines of the hull and the size of the anchor chain.

The pipe with the out board flange is cast entire, as shown in Fig. 1, while the deck flange as shown in Fig. 1 is cast separate and subsequently riveted upon the deck. These pipes are usu-

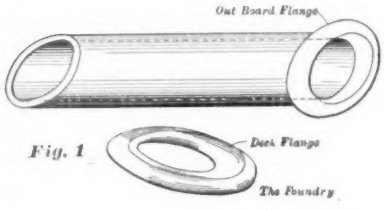


Fig. 1

ally of cast iron and their construction affords a very good example of what may be termed cross templet and hollow pattern work.

It will readily be seen that this form of templet and method of making a pattern can be used in a very large number of ways for special pipes, etc. The outboard opening of these pipes often assumes different forms, to accommodate the stock of the anchor. In some cases the pipe flares outward in the form of a bell. When this is the case, it requires a complete pattern parted longitudinally with the inside, worked out to form the desired metal thickness. The inside of the pattern then serves as a core box for forming the green sand core, the core being lifted out with the aid of a core bar or skeleton.

To illustrate more fully the position and arrangement of these pipes when in place, two views of the bow or forward part of the hull are shown in Fig. 2.

The customary practice in most ship yards for transferring the angle of the deck and the hull to the pattern is as follows: The pattern is made solid or lagged up, and of about the required length. It is then shoved down through the openings provided in the deck and the hull and secured in place. The outline of the opening is next scribed

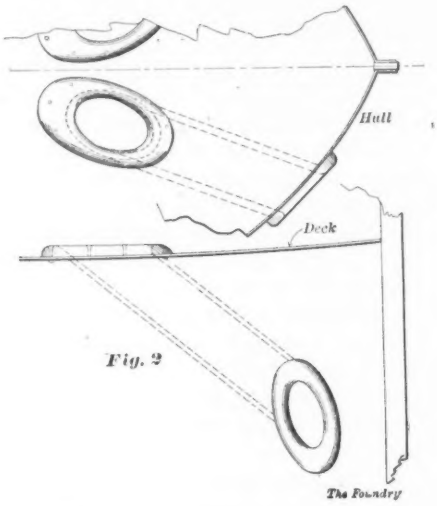


Fig. 2

around the pattern and is dressed off while in this position. Material equal in thickness to the contraction in the length of the pipe is added to one end. Next a core print is dressed off to conform to the angle of the deck and attached to the pattern. Any patternmaker who has been so unfortunate as to fall heir to this particular job will agree with the writer that the method illustrated and described in these columns is far superior to the method mentioned.

Making the Templet.

The form of templet used in connection with this method is termed a cross templet, as a cross section of the templet would be in the form of a cross, as shown in Fig. 3, which illustrates three views of the templet during the three stages of its completion as applied to the hawse pipe pattern. At the left in the figure is shown the templet nailed and bracketed together, and ready for the next operation which is the cutting of the angle on the ends. To cut the angle on the ends the templet is shoved down through the opening on the deck and out through the opening in the hull and clamped in position. The ends are next sawed off and dressed to conform to the angles of the deck and hull. The templet would now appear as shown in the central view of Fig. 3. The work thus far is done by the templet maker, who now turns it over to the patternmaker.

The separate parts of the pattern are shown in Fig. 4. At the right and left of the figure are the two barrel or cylindrical sections which have been sawed and dressed to conform to the angles of the ends of the templet

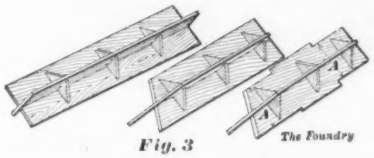


Fig. 3

which is shown in the center of the figure. These two cylindrical ends of the pattern are lagged and glued up over cylindrical heads having a diameter equal to the inside diameter of the pipe. A dry joint is left in the lagging on each side to permit the removal of the pieces from the heads and the cleaning of the inside of the pieces. The outer diameter is next turned to size, the lagging being secured to the circular heads with screws, which are removed as soon as the turning is completed. The heads are then taken out and the inside of the lagging cleaned up. The semi-circular ends are then glued together as shown at the right and left of Fig. 4.

The templet being made of the same diameter as the outside of the pipe necessitates the cutting down of each end of the templet as shown at A, to allow this portion of the templet to enter the inside of the pattern. The ends are then slipped over the templet and secured with screws, the cylindrical ends being dressed off to conform to the angle of the templet as shown. Of course allowance has to be made for

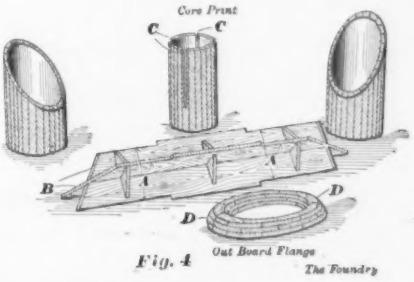


Fig. 4

the shrinkage of castings and this is accomplished by nailing strips on one end of the templet as shown at B, Fig. 4, the thickness of these strips being equal to the shrinkage which would take place in the length of the pipe. At the top of Fig. 4 is shown a core print which is attached or inserted into the end of the pattern which is without a flange, that is, the deck end of the pattern. This core print is lagged up in the ordinary manner and the outside turned to the proper diameter. If the inside diameter of the pattern has been lagged up carefully the core print should slip into it snugly. Of course it is necessary to make some allowance for clearance. The slots shown at C in the core print must be cut to allow the core print to slide past the templet. A temporary head is used in the upper or open end of the

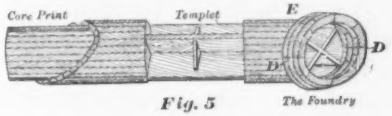


Fig. 5

core print when lagging it up and turning it and is subsequently removed, after which the slots are laid out and sawed to suit the templet.

The assembled pattern is shown in

Fig. 5, in the correct position for molding. It will be observed that the pattern is so placed as to cause the flange to set in a perpendicular position, this being necessary to allow the coping off of the flange end of the pattern.

The flange, ready to attach to the pattern, is shown at the bottom of Fig. 4. It is built up in segments and worked out to form, being parted along the line D D, so that the upper half can be allowed to lift off with the cope when molded. Loose dowel pins are used to secure the entire flange in position. A chipping strip E of about one inch in width and ⅜ inch in thickness is attached around the outer edge of the flange with loose pins. The object of the chipping strip is to facilitate the fitting of the flange to the hull. Where hawse pipes are of the same diameter, one templet may be made to serve for several pipes, or the circular end may be readjusted upon a templet trimmed to the new angle and the old pattern thus made to serve for more than one vessel.

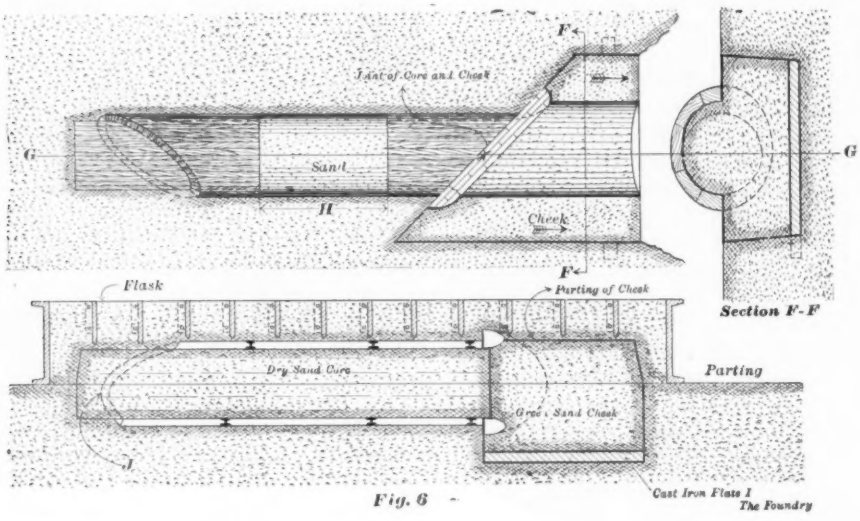


Fig. 6

Molding of the Pipe.

The molding of this pipe contains some points of interest, particularly in connection with the cheeking off of the flange end. A plan and two cross sections of the completed mold are shown in Fig. 6. At the top of the illustration is shown a plan of the mold with the pattern in place ready to have the flask placed in position for ramming the cope. At the right is shown a cross section through the cheek on the line F F, while at the bottom of the figure is shown a longitudinal section of the complete mold on the line G G. In beginning this work provision is first made for checking off the end containing the flange, after which the pattern is bedded in. During this operation that part of the mold occupied by the open space H between the two lagged up ends of the pattern is made up by ramming the sand about the pattern at the ends, removing the pattern and striking out the central portion with a straight edge to conform to the rammed up portion. Parting sand is now applied to this struck off surface and the pattern returned to place. A parting is next made around the pattern and up to the line of the cheek. Sand is used to fill up the opening H in the cope, the sand being struck off to conform to the ends as shown.

A bed is made to receive the cast iron lifting plate I which is dropped in place. For illustration a plate of triangular form is shown, but the shape and size of the plate is generally governed by the available material about the foundry. The flange which is not

fast is now secured to the pattern with loose pins and the ramming up of the cheek commenced. A parting is made at the rounding surface of the flange above the parting of the mold as shown. A parting has also to be made along the line of the joint of the dry sand core in the cheek. This is accomplished by ramming sand into the end of the pattern and making a parting by striking it off even with the pattern. This parting is then covered with

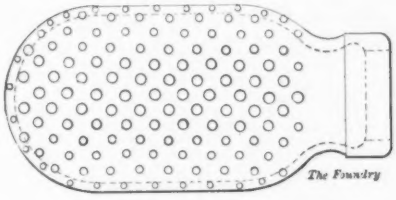


Fig. 1

paper while the cheek is being rammed.

The cope is now placed in position and staked down. It is then rammed up and lifted off in the usual manner. The upper half of the flange lifts off with the cope. The cheek is next slightly lifted and drawn

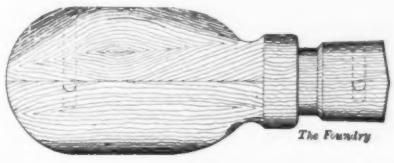


Fig. 2.

forward in the direction of the arrow, allowing the lower flange to be drawn back out of the cheek. The body of the pattern is then free to be drawn, with the exception of the point J, which necessitates a slight longitudinal movement of the pattern toward the cheek to allow this point to clear before the pattern is drawn from the mold.

The mold is then dressed in the usual manner, the cheek moved back into position and backed up by ramming the sand behind it. The dry sand core which forms the interior of the pipe and which is constructed with the aid of a frame and angle box, is now set in position upon chaplets and butted up to the cheek as shown. The cope is placed on, weighted, and the mold prepared for pouring. This entire mold is made in green sand, with the exception of the dry sand core mentioned.

THE USE OF NAIL CORES.

BY H. J. MCCASLIN.

The use of nail cores in perforated cast iron strainers for the intake or suction end of pipes for pumps will be found a very simple and economical method of executing work of this

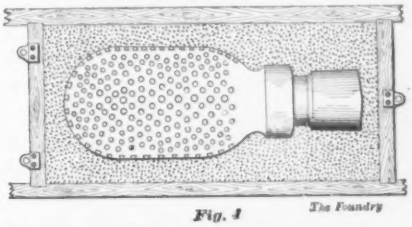


Fig. 4

character. While the manner of coring the holes is shown as applied to a strainer of cylindrical form as shown in Fig. 1, it can be applied to almost any form. It is particularly well adapted to flat work such as strainer

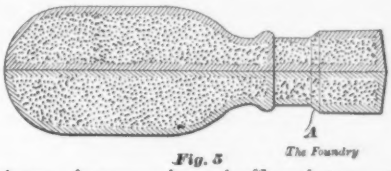


Fig. 5

plates, furnace door baffle plates, etc. The pattern is parted longitudinally and turned up as shown in Fig. 2. It will be observed that the core print is

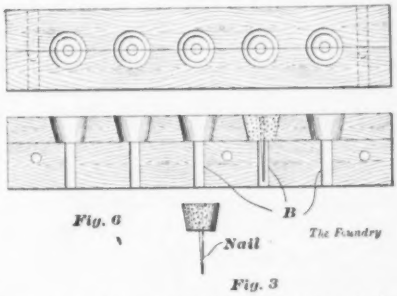


Fig. 6

Fig. 3

turned with a shoulder A, this being done to insure its proper setting into the mold. The mold having been rammed up in the ordinary manner and

the pattern drawn, the nail cores, as shown in greater detail in Fig. 3, are set at proper intervals around the mold as shown in Fig. 4. The body core shown in Fig. 5 is then placed in position and supported by the nail cores. These cores are similar to those commonly used in coring babbitt anchorage in bearings. They are formed in a multiple core box as shown in Fig. 6, the hole B permitting the nail to be inserted through the core before the box is turned over upon the plate.

TAPER REAMERS.

BY H. N. TUTTLE.

In some classes of metal pattern work, the taper reamer is a very useful tool for giving draft to bolt and screw holes, and all round holes from 3-16 inch to 1½ inch in diameter which "draw their own cores." Any shop which has much of this work to do, should be well supplied with reamers suitable for this class of work.

It is often better and more accurate to locate and drill the holes in the metal pattern and ream them out, than to make the holes in the wood master-pattern. A reamer should never be used on the scale surface of a cast hole in iron or brass. The hole should be either cast small enough to run a drill through before reaming, or be cast solid and drilled.

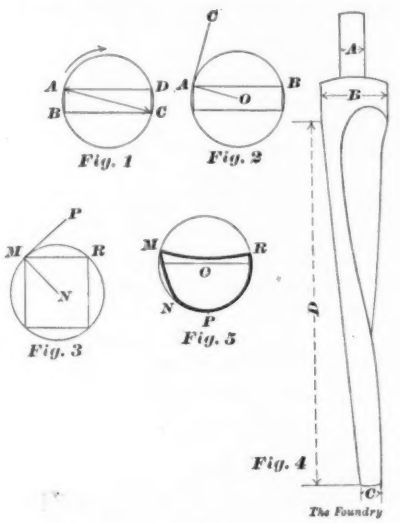
There are several varieties of reamers, each of which has its own advanvantages and disadvantages.

The ordinary fluted reamer is a very useful type, doing good work generally upon iron, brass, and hard metals, but has a tendency to "pin up" on the softer metals. The tools upon the market are quite apt to chatter, making polygonal holes instead of round ones. This is due to the regular spacing of the flutes, caused by each tooth dropping in the "bite" made by the previous tooth. This difficulty may be easily obviated by spacing the flutes irregularly.

Most fluted reamers do not have taper enough to work, and they are difficult to make or to sharpen in the pattern shop.

The square reamer is easy to make and to sharpen and works nicely in brass, and passably in iron, if kept in good shape, but is practically of no value in the soft metals.

The flat reamer is easily made and sharpened and does good work on most metals. Fig. 1 shows the method of grinding. After the steel is turned to the proper taper, it is ground to a rectangular cross-section—A B C D, with the thickness A B equal to about one-quarter the diameter A C. Now, considering the reamer to be rotated



in the direction of the arrow, A and C will be the cutting corners. Then, from corners B and D just enough clearance should be ground to allow for the desired cut of A and C. In this way, while A and C are cutting, they are also supported on the opposite sides by the bearing surfaces at B and D. On account of these bearing surfaces running against the finished hole, the tool should be liberally supplied with oil to prevent scratching.

Although the flat reamer ground in this manner has a square cutting edge, the same as the square reamer, it has much more top clearance and for this reason it cuts better. This may be seen from Figs. 2 and 3. Fig. 2 represents a cross-section of the flat reamer and Fig. 3 of the square. The direc-

tion of the cut in Fig. 2 is the line A C perpendicular to the radius A O. This gives the top clearance C A B while in Fig. 3 the top clearance is the angle P M R. These flat reamers, being thin, cannot be made as long as the square or fluted ones; two or three inches being about as long as the small sizes should be made.

Metals which have a special tendency to "pin up" always give particular trouble when it comes to using the taper reamer. This is due to the wide shaving and square cut, and to the difficulty of keeping a perfectly smooth sharp cutting edge.

The best reamer for this class of work is the half round reamer, ground with a backward spiral.

This tool, if properly made and sharpened, will cut a taper hole in aluminum (which is the worst of all pattern metals about "pinning") of any length, as smooth as the finest burnished surface. The tool literally does burnish, under oil, the work as fast as it cuts.

This tool is shown in Figs. 4 and 5, and may be made in any pattern shop equipped with a carriage lathe and emery wheel.

The steel is cut down at A, (Fig. 4) small enough to enter the drill chuck. B is the size of the largest probable hole to be tapered and C, of the smallest, while D is of such length as to give the desired taper, or draft. The tool from which the cut was taken was made of the following dimensions: A, 5/8 inch; B, 1¼ inch; C, 5-16 inch; D, 7 inches.

The cross-section of a half round reamer should be made like Fig. 5. The face should not be ground away quite to the center, so as to leave somewhat more than a half circle bearing.

Then, considering M as the cutting edge, clearance should be ground from M to N, which is a point midway from M to P, P being the center of the back of the tool.

Ground in this way the reamer has sufficient bearing to prevent chattering, and to make a steady, even cut, while at the same time the clearance is such that the bearing surface N P R crowds the cutting edge M into the work.

This tool should be ground with a spiral face, so as to give a shear rather than a square cut, and the spiral should be a left hand one, so as to tend to crowd out of the work when in use. If the spiral were made right hand, the reamer would bite into the metal so savagely as to prevent good work.

After the tool is turned to the proper shape, the taper part should be polished as highly as possible. If this is not done, the tool will be liable to "pin up" on the back, and scratch the hole.

A worn out mill file, well chalked to prevent "pinning," should be used while the work is still in the lathe; fine emery cloth being used to finish the job.

The spiral may next be laid out, by means of a strip of paper. A quarter or third of a turn will be sufficient twist, and this amount can be nicely ground upon the rounded corner of an ordinary emery wheel.

Since it is necessary to be very careful in filing the clearance from M to N, so as not to file the cutting edge below the turned surface of the reamer, it is well to copper-plate the tool before "laying out." This is an expedient much used by tool makers, as it is of great assistance in filing or cutting to an edge, or to a line. This on account of the difference in color, showing exactly where the work is being cut.

A solution consisting of one ounce copper sulphate, four ounces water, one dram nitric acid is spread over the tool, whereupon it immediately deposits a coating of copper.

(Note.)—This same solution is often used in soldering brass numbers on cast iron patterns. The place where it is desired to solder the number is first brightened, and then coppered by merely touching a little of the mixture to the proper place. This coppered surface will "tin" as readily as any copper, though, of course, the joint

FLUOR SPAR AS A FLUX.

In the July number of THE FOUNDRY you publish a communication on "Fluxes in the Cupola" by N. W. Shed, of Buffalo, N. Y., which to a fluor spar miner seems somewhat misleading.

We instance one of Mr. Shed's sentences, "Limestone is far cheaper than fluor spar and far better as a flux."

Fluor spar is composed when pure of 48.14 per cent fluorine and 51.86 per cent of lime and is considered almost absolutely necessary in every open-hearth steel plant in the world as simply a flux. During the past few years it has been put in service in many blast furnaces, one of the users. the Red River Furnace Co., of Clarksville, Tenn., says "Fluor spar is a very great help when a furnace gets bunged up with a heavy sticky cinder to introduce it through the blow pipes, the effect is almost instantaneous relieving the pressure at once." The writer adds, "The relative efficiency between limestone and fluor spar is as follows: Calcium efficiency of limestone is only 40 per cent while the calcium efficiency of fluor spar is 51 per cent. The molecule weight of calcium carbonate is practically 100 and calcium fluoride 78, having in fluor spar much greater efficiency with less weight, thus effecting considerable saving as to quantity used. It makes a liquid basic cinder and thus is far more apt to take up sulphur than a lime slag."

Mr. Shed remarks in the same article: "Another value of fluxes is their cleansing action on the cupola." If Mr. Shed will take a lump of our Tennessee fluor spar whenever he has occasion to clean out a dirty, soot covered chimney, placing it on the coals he will have a perfect demonstration of how quickly "good" fluor spar will cleanse the chimney of its dirt.

During the past year the number of foundries using fluor spar as an aid in fluxing their charges has increased perhaps ten times, and we have yet to hear of one who did not consider it an aid in producing a cleaner, higher tensile strength iron. It is self evident that fluor spar as a flux pure and simple is the strongest, most active mineral of cheap cost that we have. The only objection that many blast furnace and foundrymen make is a fear that its known antipathy to silica will not only keep their stacks clean but will make them too clean taking off some of the silicious lining. One of the great difficulties the fluor spar dealer has to encounter is the proneness of the foundryman to use too great a quantity of fluor spar in his charges. The use of a very few pounds in a large charge will be of absolute service while a large quantity will very likely prove the reverse. If Mr. Shed is in position to make a test of a perfect quality of fluor spar in a foundry we offer to furnish him with a barrel of 600 to 700 pounds for that purpose providing he will tell THE FOUNDRY the results. It goes without saying that this communication is based entirely on what our customers tell us, as outside of attempting to run a hundred-ton blast furnace for two weeks in Alabama with fluor spar the writer has no practical experience. As a matter of fact, however, when many of the largest foundries in America continue year after year buying fluor spar for their fluxing purposes it is a fair bet that they are not throwing their money to the dickey birds.

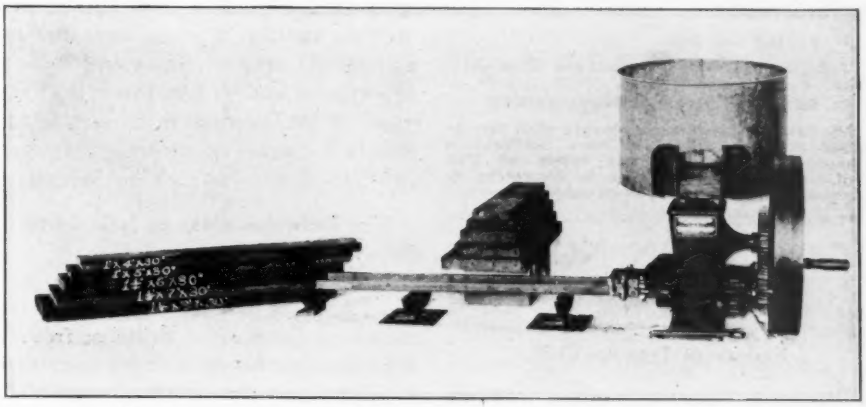
With a high appreciation of THE FOUNDRY we remain,

Very truly,
D. C. ROBERTS,
of Roberts & Co.

A SLAB CORE MACHINE.

Flat or slab cores are required in large quantities for certain classes of work, especially in steel foundries, and many attempts have been made to produce these successfully on a core machine. We believe, however, that the first successful machine of this type is illustrated in the accompanying half tone, which shows a machine recently designed by George H. Wadsworth, and manufactured by the Falls Rivet & Machine Co., Cuyahoga Falls, O. With this machine cores are made

varying in width from 4 to 9 inches, the standard sizes being 1 x 4 x 30 inches, 1 x 5 x 30 inches, 1¼ x 6 x 30 inches, 1¼ x 7 x 30 inches, and 1¼ x 9 x 30 inches. The cores are made rapidly and are very accurate. Several vent holes are formed in each core, the number depending on the width of the core. The change from cores of one size to another, that is, the change in dies, takes but a few minutes. We believe that a machine of this type will find a ready sale and should fill a long felt want.



A SLAB CORE MACHINE.

GENERAL INDUSTRIAL NOTES.

The Globe Malleable Iron Co. has been organized at Syracuse, N. Y., by Alexander T. Brown, president of the Franklin Mfg. and the Brown-Lipe Gear Companies. Willard Lipe, vice president of these two companies, Joseph S. Pickell and Sidney J. Marshall, with a capitalization of $50,000. The plant built by the Hyle Steel Tool Co., which went into bankruptcy, has been purchased and will be put in shape for the manufacture of malleable iron castings.

The Bell & Fyfe Foundry Co., Kent avenue and South Eleventh street, Brooklyn, has sold its property in that city and leased the old Astoria steel foundry, Astoria L. I. Operations at the new location will begin September 1, when the firm will be in position to handle castings of any weight up to 50 tons.

The H. J. Hartmann Foundry Co., Grand Rapids, Mich., has been incorporated with a capital stock of $26,000 and will continue the business of F. Hartmann & Co. The incorporators are: Henry J. Hartmann, John Lynch, Frederick E. Bonell, Frank S. Aldrich and Joseph S. Alicki.

At the annual meeting of the Allegan Foundry & Machine Co., Allegan, Mich., Dr. C. W. Young was elected president and T. S. Undyke secretary and treasurer.

The South Side Steel & Malleable Casting Co. has been formed at Milwaukee, Wis., by Fred A. Lange, Fred Hildebrand and Fred Graff, for the erection of a plant south of Milwaukee's city limits. The company has a capital of $40,000 and will manufacture malleable castings, giving employment to several hundred men.

The machinery and equipment of the Phelps foundry at Weisner, Idaho, have been purchased by W. W. Pritchett and Lew Waters, who will operate the foundry.

The Summers Foundry & Machine Co., has been incorporated at Hinton, W. Va., with a capital stock of $10,000.

The North Texas Foundry & Machine Co., Paris, Tex., has been incorporated with a capitalization of $25,000 by Lee Totten, J. N. Totten, C. J. Turner, of Paris, and J. H. Bright, of Houston.

METALS IN FOUNDRY PRACTICE

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Malleable Iron and Steel.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

We have also made arrangements with several others to act as special contributors. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

Failure of Iron to Chill.

Inquiry.—We are making sheaves and chilled rollers and are having considerable trouble in getting the chill into the iron. We use an iron chill in the mold, three inches thick at that part where the groove comes, but the face, which should be hard and white, is gray like the balance of the castings. We have been able to make a chill about ⅛ inch deep by tapping 100 pounds of cupola iron on to 25 pounds of white iron placed in the ladle. Can you advise us what kinds of iron to use for this purpose? Also say if there is anything which we could add to the iron in the ladle to produce the required chill.

Answer.—This question has been answered many times in these columns. The difficulty is that the founder does not understand the influence of silicon in cast iron. Also, it should be understood that some irons will chill and some will not chill, however low the silicon. You are not using irons that naturally chill. As you want to make soft and also chilled iron castings in the same heat, it is better to add, to the part of the heat used for chilled work, enough old car wheels broken in small pieces, to produce the required chill. Not long ago I had a sample of a sheave that had been cast against a chill that was white for ⅛ inch deep. At another time a sample of a corn grinding mill which was all white iron, but both were so soft as to be drilled. In fact the chill on the sheave was softer than the gray hub. When a non-chilling iron is run against a chill, the fracture against the chill will show an intensely black grain and will be softer than the part of the casting that cools more slowly. There is nothing that you can add to the ladle to increase chill.

The Defective Gear of June Issue.

W. J. Keep, Esq.,

Dear Sir:—

I have your letter of the 16th inst. enclosing analysis of drillings from a defective gear wheel and must say that it is a most remarkable exhibit. It would be interesting to have a test piece turned from one of the arms of the wheel. I doubt if it would show 17,000 pounds per square inch. The metal in gears should pull 25,000 pounds per square inch. There is more than twice the amount of phosphorus that should be in any casting intended to resist shocks of strains. The silicon is far too high, only suitable for small pulleys and the like, while the combined carbon is consequently much too low for strong castings. The metal might be suitable for so-called "Berlin Castings," i. e., ornamental plaques, reproductions of armor, etc.

You may find on page 687 of the *Iron Age* of Feb. 22, 1906, complete analysis of bars of soft yet strong cast iron, showing very different composition from that of the defective gear wheel.

Yours truly,

A. E. OUTERBRIDGE JR.

Note.—Mr. Outerbridge is metallurgist for Wm. Sellers & Co., Philadelphia, and we give below for reference, the analysis of the defective wheel, also the analysis above referred to.

Defective Gear.

T. Carbon	....
C. Carbon	.11
G. Carbon	....
Phosphorus	1.23

Sulphur	.057
Silicon	2.21

Estimated tensile strength, 17,000 pounds per square inch.

Wm. Sellers & Co., Gears.

T. Carbon	3.108
C. Carbon	.784
G. Carbon	2.326
Phosphorus	.547
Manganese	.387
Sulphur	.063
Silicon	1.740

Actual tensile strength, 36,546 pounds per square inch.

Variation in Tensile Strength.

Inquiry.—We are making castings for the United States government, requiring a one-inch coupon cast on the casting, which we test for tensile strength, the result being very unsatisfactory, as bars from the same heat vary from 18,000 pounds to 27,000 pounds per square inch. What is the reason for this?

Answer.—So long as the government requires that the test bars shall be attached to the casting, the test record will be of very little value. Suppose you make a small casting that will cool nearly as rapidly as the one-inch coupon which is attached to it, and from the same ladle pour a very heavy casting which will require 24 hours to cool and to which a one-inch coupon is attached. The coupon from the small casting would likely break at 27,000 pounds per square inch. The outer end of the coupon from the large casting would cool down nearly as quick as the coupon attached to the small casting but the inside end being attached to a liquid casting would cool as slowly as the casting and the grain would be as coarse. When pulled the test bar would break near the grips where the grain was coarsest and would likely give only 18,000 pounds per square inch.

All test bars should be of a standard size, should be cast the shape desired and should be tested as cast, and should be molded in a flask separate from the casting, but should be poured from the same ladle as the casting.

In such case the test bars will always represent the relative character of the iron.

If the government wishes a coupon on each size of casting it should specify the strength for each size. If, however, it requires only 18,000 pounds for all castings, the specification is fair to you.

The pull of a cast iron test bar in a tensile machine is never true and some variation must be expected from this cause. Under present practice you must make your mixture so that the test bar from the largest casting will conform to specifications.

TRADE PUBLICATIONS.

The Joseph Dixon Crucible Co., of Jersey City, N. J., is distributing a paper bound booklet, containing 20 pages, entitled "Unions for Steam Pipes," by W. H. Wakeman. This is a reprint of a series of articles published in *Graphite*. The matter will be found of interest to any one using piping and is mailed free by the Dixon company to any one interested in this subject.

The De La Vergne Machine Co., whose works are at the foot of East 138th street, New York city, has just issued a 10-page folder describing the Koerting four-cycle gas engine and the Koerting gas producer, for both of which they hold the American patent rights. Now that the gas engines are becoming so extensively used for a source of power, and especially suction gas producer plants, it will pay any foundryman to look into this new means of power production.

The Ingersoll-Rand Co., of New York city, has issued a catalog upon its "Imperial" type eleven power-driven air compressors. This is a standard size catalog containing 28 pages of matter descriptive of this type of compressor and a few other facts concerning the company. The type mentioned is an exceedingly compact belt-driven compressor which can be driven either by belt or by direct-connected motor and will be found exceedingly useful in a large variety of manufacturing plants, where compressed air is required for certain tools and yet it will not pay to install one of the larger steam-driven machines.

THE FOUNDRY

PUBLISHED MONTHLY BY

THE PENTON PUBLISHING CO.

CLEVELAND

BOSTON DULUTH CHICAGO

CINCINNATI NEW YORK

PHILADELPHIA

PITTSBURG

The subscription price of THE FOUNDRY is $1.00 a year to points in the United States, Canada and Mexico. To Great Britain: Eight Shillings. Single copies 15 cents each.

Change of advertising copy must reach this office on the 10th inst. preceding date of publication.

The Cleveland News Company will supply the trade with THE FOUNDRY through the regular channels of the American News Co.

European Agents: The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Practical articles pertaining to the trade in all its branches are solicited and will be paid for.

When sending articles be sure to place your name and address on the article and on the drawings.

Entered as second-class matter at the Post-Office at Cleveland, Ohio.

PRINTED IN AN OPEN SHOP.

CONTENTS.

Manufacturers' Foundry Co..... 379
The Position and the Man..... 385
A New Hot Blast Cupola..... 387
Comparative Designs and Working of Air Furnaces..... 390
Open Hearth Steel Castings..... 399
Machine Molded Cast Gears..... 407
The Study of Molding Sands..... 411
Practical Alloying..... 413
Mixtures for Chandelier Work..... 415
Gun Metal Rolls..... 416
Cire-Perdue Process at the Roman Bronze Works..... 417
Brass Foundry Notes..... 422
Brass Tablets..... 423
Hawser Pipe Patterns..... 426
The Use of Nail Cores..... 429
Taper Reamers..... 430
Fluor Spar as a Flux..... 432
A Slab Core Machine..... 432
Cast Iron Notes..... 434
Trade Outlook..... 436
British Foundry Notes..... 436
Personals..... 439
Deaths..... 439
Fires..... 439
New Construction..... 440
General Industrial Notes..... 442

TRADE OUTLOOK.

The foundry conditions, as far as the amount of work on the books of the foundries is concerned, remains about as it stood the first of July. The most important change in the situation is found in the advance in the price of pig iron. A large number of the northern furnaces are pretty well sold out and southern iron is advancing. Some sales of southern iron have been made recently at $13 per ton for No. 2 foundry Birmingham, but the usual price is $13.25, while some furnaces are holding for $13.50. In the north foundry iron is becoming exceedingly scarce and No. 2 foundry is quoted at $16.50 at the valley furnaces. The scarcity of foundry iron in northern Ohio is shown by the fact that a considerable quantity of foundry iron has been shipped to Cleveland from Ironton, O. Most of the furnaces producing Bessemer, basic or foundry brands are pretty well sold out for the balance of the year. The principle malleable interests have recently purchased 25,000 tons of malleable.

This constant advance in the price of pig iron is not accompanied by corresponding advances in the price of foundry castings and, especially in the case of heavy work foundries, the margin of profit is still very close.

BRITISH FOUNDRY NOTES.

Birmingham, July 7, 1906.—The arrangements for the conference of the British Foundrymen's Association are approaching completion. As at present arranged it is to meet at Middlesboro on Tuesday, Wednesday, and Thursday, Aug. 7, 8, and 9, following Bank Holiday. A large attendance is expected. The president-elect is Mr. H. Pilkington, manager of the Sheepbridge Iron Co., Sheffield. This promises to be a popular election. Mr. Pilkington has been associated with the organiaztion since its commencement, and has had some experience of scientific and organized bodies. He is a former president of the South Staffordshire Iron Masters' Association, and for many years has

been a member of the Iron and Steel Institute.

Mr. F. J. Cook is named for the vice presidency. He is at present secretary of the Birmingham branch and has all along been an active worker with the association. Mr. Cook combines to a remarkable degree the scientific and practical qualifications. He is connected with the local Association of Engineers and the Metallurgical Society, and takes an important share of the work in connection with the metallurgical department of the Birmingham Technical School. He has had a very practical training, having had an engineer's education and has been through the drawing office in addition to ample foundry experience. He was apprenticed with Messrs. Jos. Evans & Sons, Wolverhampton, before entering the large establishment of Messrs. Bellis & Moorcom, Birmingham, where he is now foundry manager. Mr. Cook had done importatnt work in the designing of foundries, as well as in actual foundry work, and his genial personal qualities make him a favorite.

The services of Mr. Buchanan, who has been president since the formation, and whose great practical knowledge has been of the greatest help will be recognized by a vote of thanks. While retiring from the official headship of the organization, he has promised to continue his interest, and will still be a hard worker in its behalf.

The mornings of each day will be devoted to the reading of papers. Among those who have been invited to render service in this direction are: The president-elect, Mr. Pilkington; Mr. J. E. Stead, Middlesboro, a well-known figure in connection with the Iron and Steel Institute, Bessemer medallist, and a most distinguished chemist; and Mr. Percy Longmuir, Sheffield, a Carnegie gold medallist, an old member of the National Physical Research Society, and a practicing chemist and metallurgist, and others.

It is intended to spend the afternoons in visits to foundries, and probably in the evening, there will be visits to electric light and tramway stations. Recreation occupies a very subordinate place in the program; but it is hoped that the third day may be practically given up to excursions, or visits of a non-technical character.

The representative character of the council may be judged from the following list of names: Mr. C. Moorhead (manager for Messrs. Willans & Robinson, Rugby), Mr. W. F. Bagnall (principal proprietor Bagnall & Sons, Shalesmoor Foundry, Sheffield), Mr. Buchanan (Chamberlain & Hill Walsall), Mr. J. Ellis (Thornycrofts, Woolstanton), Mr. T. McFarlane (Horseshay Co., Salop.), Mr. R. Mason (Wright's Eagle Range Co., Birmingham), Mr. J. G. Stewart (British Westinghouse Co., Urmston, Lanc.), W. Roxburgh (Kilmarnock, N. B.). The above list covers all branches of the foundry business, including blast furnace men, metallurgical chemists, stove grate makers, and makers of small work, malleable iron work, chilled rolls, anvil blocks and other solid and hard face work, light motor work, marine work and high-class engineering such as is represented by the establishments of the Belliss and Moorcom and Willans and Robinson, with general work, rain water goods and cast steel, etc.

The new branches of the association at Birmingham and Cardiff are thriving, and promise to be very active sections.

Birmingham, lately formed, has now forty members, which is considered a very good start. Cardiff, still a later arrival is almost equally promising under the secretaryship of Mr. G. Jones, of Blaenavon. Both are looking forward to a very active season next autumn, and a full program of lectures by eminent men in the trade is being arranged.

Reports of foundry work generally are very cheerful. All the leading establishments are full of work. The machine tool makers, in particular, are very busy. Most of the work is for home requirement, but there is a good sprinkling of foreign orders. The

trade is happily free at present from anything like labor troubles, and there are practically no out-of-works. Several foundries are busy with enlargements. Messrs. Walkers, of Donnington, have their new foundry ready to start, after having been closed down for some time for reconstruction. The whole concern will be in full swing in a few weeks. Messrs. Willans & Robinson, notwithstanding their formidable financial difficulties, are doing well, and have any quantity of orders for turbines and oil engines. Messrs. Wards, Lionel street, Birmingham, recently started a new foundry at Great Bridge, a few miles out, for making their own castings. They are doing a great trade in capstan lathes, and similar machines, largely on account of the rapidity with which such improvements are being introduced into the brass trade. Nothing is heard of a restart at the Swan Foundry, West Bromwich, and apparently the career of this fine old establishment is finally closed.

The equipment of the Birmingham Electrical Establishment at Summer Lane must be reckoned one of the finest things done by engineers in this country. It is a gigantic concern. The engine room is so large that the Birmingham Town Hall which holds nearly three thousand people could be dropped bodily into it. Messrs. Bellis & Moorcom have had the mechanical furnishing. They have installed four of the six 3,000-horsepower engines required with their condensing plant, and two 800-horsepower engines for alternative current, with exciting sets. The wheels of the largest engines weigh twenty-five tons in one solid disk, and the bed plate weighs, in a single piece, twenty tons. The excellence of the work has evoked very hearty encomiums both from technical experts and municipal enthusiasts.

MILWAUKEE FOUNDRY FOREMEN.

Julius M. Germanson, Secretary, 12 So. Bay street, Milwaukee, Wis.

The regular monthly meeting of the Foundry Foremen's Association of Milwaukee was held July 2, with a good attendance. There was an interesting meeting, after which the following officers were elected for the ensuing year: Thos. Glasscock, president; Philip Nelson, vice president; Julius Germanson, secretary; George Dehn, treasurer.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.
Fred F. Stockwell, Secretary, care of the Barbour-Stockwell Co., Cambridgeport, Mass.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.
Howard Evans, Secretary, care J. W. Paxson Co.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.
F. H. Zimmers, Secretary, care Union Foundry and Machine Co., West Carson Street.

PACIFIC COAST FOUNDRYMEN'S ASSOCIATION.
J. D. Morris, Secretary and Treasurer, Seattle, Washington.

BUFFALO FOUNDRYMEN'S ASSOCIATION.
John E. Gorss, Secretary, 23 Builders' Exchange.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, care the J. L. Mott Iron Works, Trenton, N. J., Secretary.

CLEVELAND FOUNDRY FOREMEN.
H. M. Lane, 610 Schofield Bldg, Secretary.

NEW YORK FOUNDRY FOREMEN'S ASSOCIATION.
C. H. Thomas, 14 Elizabeth St., So Norwalk, Conn., District Vice President.

ERIE FOUNDRY FOREMEN.
W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

INDIANAPOLIS FOUNDRY FOREMEN.
W. S. Keller, of Hetherington & Berner Co., District Vice President.

HAMILTON, ONT., FOUNDRY FOREMEN'S ASSOCIATION.
A. Chase, care Sawyer & Massey Co, Secretary and Treasurer.

CINCINNATI FOUNDRY FOREMEN.
E W. Cadwell, Secretary, care S. C. Tatum Co.

MONTREAL FOUNDRY FOREMEN.
Mr. J. F. Gaffney, care of Allis-Chalmers-Bullock Co.

PHILADELPHIA FOUNDRY FOREMEN.
John B. MacMeekin, The Abraham Cox Stove Co., Secretary.

CHICAGO FOUNDRY FOREMEN.
Mr. Thompson, Link Belt Co., District Vice Pres.

PERSONALS.

George H. McKinley has been made superintendent of the foundry of the Root & Van Dervoort Engineering Co., East Moline, Ill.

W. A. Bole, vice president and manager of the new Westinghouse Foundries Co., of Trafford City, Pa., is now in Europe studying British and European foundry methods, preparatory to laying out extensive additions to the plant at Trafford City.

J. O. Crane, who has been connected with large plants in the east for twenty years, is the new manager of the Michigan Copper & Brass Co., and expects to have its large plant, now under construction in Detroit, Mich., in operation by January 1.

Patrick McManus has resigned as superintendent of the steel casting works of the Sharon Foundry Co., at Wheatland, Pa.

E. M. White, for many years foreman of the Gainesville Iron Works, Gainesville, Ga., has accepted a similar position with the Athens Foundry & Machine Works, Athens, Ga.

Walter S. Russel, of the Russel Wheel & Foundry Co., Detroit, Mich., has returned from a two months' trip to Europe.

Rudolf Wiegelin has resigned his position with the Bessemer Foundry & Machine Co., Birmingham, Ala., to become general foreman of the foundry department of the new plant of the Payne & Joubert Machine & Foundry Co. at Birmingham.

Thomas Mitchell has been made superintendent of the Chester, Pa. plant of the American Steel Foundries. He is succeeded as assistant superintendent by Charles Lidstone.

DEATHS.

Frank E. Stoneman, vice president of the American Skein & Foundry Co., Columbus, O., was instantly killed in an automobile accident near that city on June 27. He had been instrumental in building up the American Skein & Foundry Co., though a few years ago he retired from active participation in its affairs, and last year he again became prominent in the company.

L. C. Packham, for many years a prominent figure in the malleable casting business of the central west, died June 30 at his home in Grand Rapids, Mich., at the age of 48. About seven years ago Mr. Packham went to Grand Rapids as manager of the Grand Rapids Malleable Co. and was lately connected with the Whiteley Malleable Casting Co., Muncie, Ind.

Gregor Menzel, head of the Menzel Foundry, of Minneapolis, Minn, died in Tacoma, Wash., on June 18.

George B. Buckingham, owner of the Arcade Malleable Iron Co., and the Worcester Malleable Iron Co., Worcester, Mass., died June 7 at the age of 58. He was president of the New England Foundrymen's Association from 1900 to 1901, and was first vice president of the American Foundrymen's Association in 1902. He was connected with a number of banking, trading and social organizations.

Daniel M. Curry, head of the firm of Curry & Co., machinists and foundrymen of Danville, Pa., died recently at the age of 45. About ten years ago, with F. H. Vannan, he formed the firm of Curry & Vannan, but on the retirement of the latter a short time ago took over the plant, which has since been conducted under the name of Curry & Co.

FIRES.

The plant of the Eclipse Foundry Co., Detroit, Mich., was destroyed by fire on July 9, with a loss of $10,000, which is covered by insurance. The plant was used for making aluminum castings for automobiles.

The foundry and machine shop of J. G. Newbury, Coxsackie, N. Y., was destroyed by fire June 15 with a loss of $17,000.

The American Steel Foundries plant at East St. Louis, Ill., was damaged to the extent of $20,000 by fire June 28.

The brass foundry of the Engelbach Machine Mfg. Co., Leadville, Colo., was damaged by fire on June 17 to the extent of $1,000, partly covered by insurance.

The Puget Sound Iron & Steel Works, Tacoma, Wash., were damaged to the extent of $15,000 by fire June 20. The loss was chiefly confined to the destruction of marine engine patterns.

NEW CONSTRUCTION.

The Union Foundry Co., of Fitchburg, Mass., has just completed additions which have doubled the capacity of its plant.

The Bridgeport Malleable Iron Co., Bridgeport, Conn., is receiving estimates for an extension to its foundry, 71 x 313 feet.

The Solvay Foundry Co., recently incorporated at Syracuse, N. Y., with a captal of $100,000, is to erect a large foundry at Solvay for the manufacture of malleable iron castings. The main building will be 250 x 360 feet, of reinforced concrete, and will cost about $60,000. The incorporators are Frederick Frazer, Charles R. Jones, Hendrick S. Holden and William W. Willard, of Syracuse, and Ogden P. Letchworth, of Buffalo.

The Connellsville Machine & Car Co., Connellsville, Pa., is replacing its plant which was destroyed by fire about a year ago with three large buildings, which are rapidly nearing completion. Electric power will be used in all departments and four large traveling cranes will provide handling facilities.

The Rust Boiler Co. is to erect a new plant at Midland, Pa., for the manufacture of the Rust water tube boiler. The main building will be 100 x 500 feet, with other buildings, including pattern shops and warehouse. The offices of the company are in the National Bank building, Pittsburg.

The West Latrobe Foundry & Machine Co. is to rebuild its plant at Latrobe, Pa., recently destroyed by fire, on a larger scale.

The Kelly Foundry Co. is building an addition 50 x 100 feet to its plant at Elkhart, Ind. This will be used for a foundry and pattern storage, and will enable the company to double its force of molders.

The L. S. & M. S. Ry. has lately increased the size of its pattern storage house at Elkhart, Ind., by making it two stories in height.

An addition to the plant of the Detroit Steel Casting Co., Detroit, Mich., which will require the employment of more than 100 additional men, is now in progress. The plant has been entirely rebuilt within the last year and now employs over 600 men and produces about 2,000 tons of steel castings per month.

It is expected that the addition to the plant of the Pittsburg Steel Foundry at Glassport, Pa., which is to be used for the manufacture of car bolsters, will begin operations in August.

The Griffin Wheel Co. has taken out a permit for the erection of a $30,000 addition to its present plant at Denver, Colo., and will increase the capacity of the plant from 300 to 500 wheels per day.

The Bettendorf Steel Car Works, of Davenport, Ia., has begun work on the construction of a large foundry.

The H. S. Macauley Co., is erecting a foundry and pattern shop at Berkeley, Cal., in which it will employ about 300 men.

A. W. Neudeck and Hartzell Fisher recently applied to the West Side city council of Kansas City, Mo., for a lease of five acres of the levee along the Missouri river, on which they propose to erect a malleable iron foundry.

The Colorado Gray Iron Foundry Co., of Denver, Colo., will shortly erect a plant consisting of a foundry, 110 x 250 feet, a pattern shop and storage building and a power plant. The plant will be equipped with two cupolas, one of 60 inches diameter and the other of 96 inches, electric traveling cranes, air compressor, etc. The foundry output will be about 100 tons daily at the start. F. S. McNamara is general manager.

Ens & Orr, proprietors of the Somerville Brass Foundry, Denver, Colo., will soon erect a modern foundry and machine shop, at a cost of $20,000.

The Amherst Malleable Iron Co., Ltd., Amherst, N. S., has been incorporated with $100,000 capital stock to manufacture malleable iron castings. An extensive plant is being erected and its operation will begin in early fall. N. Curry is

president and G. S. Crossman secretary and treasurer.

On account of the great activity in railway building in western Canada, the Canada Foundry Co., which has a large plant in Toronto, Ont., has decided to locate a branch for the manufacture of car wheels at Port Arthur, Ont.

The J. R. Saylor Co. is building an addition to its foundry at Pottstown, Pa.

The Mitchell-Van Meter Co., Pottstown, Pa., manufacturing brass castings, is erecting a new core room, 40 x 120 feet.

The Danville Stove & Mfg. Co., Danville, Pa., has recently erected a fireproof pattern storage house, 36 x 120 feet.

Charles W. Denny has been awarded the contract for an addition to the foundry of the Fowler & Wolfe Mfg. Co., at Norristown, Pa., to cost $3,000.

The H. K. Porter Co., of Pittsburg, has secured the deed to its recently acquired property at Economy, Pa., and will at once begin the work of erecting one of the largest locomotive plants in the world, moving from the present site at Lawrenceville as soon as the new plant is ready for operation. The new site is on the Fort Wayne division of the Pennsylvania railroad near the Ambridge plant of the American Bridge Co.

The Dick Agricultural Works, Canton, O., has completed a one-story addition, 64 x 72 feet, which will make room for the employment of twelve more molders.

Plans are now being made for the new plant of the Eureka Brass Works, which will move from 217 West Second street, Cincinnati, O., to Brighton, a suburb of that city. The main building will be of brick, 100 x 103 feet, and the capacity of the plant will be greatly increased.

The Portsmouth Stove & Range Co., Portsmouth, O., has awarded the contract for two new buildings to replace the plant recently destroyed by fire. The new buildings will cost approximately $65,000.

The R. K. Le Blond Machine Tool Co., Cincinnati, O., recently purchased land in that city on which it is reported that a foundry will be erected.

F. E. Davis & Son, who operate a machine shop in Urbana, O., are building an addition to their plant in which they will start a foundry.

The Victor Foundry & Mfg. Co., Hamilton, O., has let the contract for a brick building, 80 x 200 feet.

Shartle Bros. have begun the construction of their machine shop and foundry at Middletown, O., and expect to have the plant in operation by October 1. The main building will be 84 x 100 feet, of steel and concrete construction.

A brick addition is being built for the Mechanics' Foundry, at Evansville, Ind.

The Whitely Malleable Castings Co., Muncie, Ind., has closed its plant for a few weeks for the purpose of making extensive repairs.

John Harshman has nearly completed the construction of his new foundry at Saratoga, Ind.

The William E. Pratt Malleable Iron Works, Joliet, Ill., has had plans prepared for additions which will double the capacity of its plant. When these are completed the company will melt about sixty tons of iron a day.

The Chicago Malleable Castings Co., Chicago, Ill., has purchased 10½ acres of land adjoining its present plant, and expects to erect a foundry during the coming fall or next spring.

The Independent Stove Co., Detroit, Mich., incorporated recently, has begun operations in a structure 107 x 150 feet, which has just been completed. Steel ranges will be manufactured. William Robinson, J. E. Ellis, and Robert Waddell are interested in the company.

A building permit has been issued to Clayton & Lambert, Detroit, Mich., for a brick foundry, to cost $8,500.

C. E. Downs, who was until recently connected with the Virginia Foundry & Machine Co., announces that he has purchased land in Duluth, Minn., for the erection of a foundry.

The Gerson-Carey Co., Lansing, Mich., has purchased a new site and has already begun work on a new brass foundry building, which will be of brick, 30 x 150 feet, and will be equipped with machinery of the latest type.

Buckley Bros., Kalamazoo, Mich., are making rapid progress in the construction

of their new foundry, which was begun a few weeks ago.

The Acme Foundry Co., Detroit, Mich., recently completed an addition, 30 x 60 feet, and now occupies a plant 138 x 225 feet, which is operated at its full capacity.

The Speakman Supply & Pipe Co., Wilmington, Del., is building a new brass foundry plant, including finishing shops and pattern department, in which the most modern equipment will be installed.

The Norton Iron Works, Ashland, Ky., has resumed operations after a long idleness in which extensive repairs have been made. Its output is mostly consumed by the Ashland steel plant.

The Fulton Co. has begun the construction of a foundry as an addition to its plant in West Knoxville, Tenn.

The Sheffield Cast Iron Pipe & Foundry Co., Sheffield, Ala., has begun the operation of its new foundry and will soon have the plant running at full capacity.

The Price-Evans Foundry Co., Chattanooga, Tenn., has moved to its new plant, which will enable the company to greatly increase its output.

The Chattanooga Plow Co., Chattanooga, Tenn., will erect an addition to its foundry, 80 x 128 feet.

The Jones & Hopkins Mfg. Co., Nashville, Tenn., has begun operating its new foundry with about 100 men.

The Russel-Compton Co., recently incorporated by W. H. Russel and others, with a capital stock of $25,000, has awarded the contract for its foundry and machine shop at Spartanburg, S. C.

The Globe Foundry Co., Port Chester, N. Y., is to erect a new plant at Huntington, W. Va. Plans are being prepared for a large molding shop of concrete, steel and glass, and a number of other buildings. Wm. A. Mills, vice president of the company, is in charge of the property.

GENERAL INDUSTRIAL NOTES.

The Westinghouse foundry interests at Trafford City, Pa., near East Pittsburg, have acquired 20 acres in addition to their present plant and will greatly increase its capacity, but no definite plans have as yet been made. It is not at all unlikely that some time in the future the foundries controlled by the company in Allegheny and Cleveland will be moved to Trafford City, where the electric machine and air brake constituent companies will be served. Charter for the Westinghouse Consolidated Foundries Co. has been obtained by Geo. C. Smith, Walter D. Updegraff and E. D. Seitz.

G. B. Buzzell has resigned the foremanship of the Boston Art Metal Co.'s brass foundry, Boston, Mass., to start a brass foundry at 262 Dover street, Boston, Mass. This will be known as the Robbins, Buzzell & Corcoran Brass Foundry Co., and will employ about ten molders.

The Boston offices of Niles-Bement-Pond Co. and Pratt & Whitney Co. have been removed from Pearl street to more spacious and handsomely furnished quarters on the eighth floor of the Oliver building, corner Milk and Oliver streets. The policy of these companies is to dispense with show rooms, the variety of both heavy and light machine tools and cranes built by their several works being too great to permit of exhibition.

The Brown-Davis Hardware Co., tool makers, machinists, founders, etc., has been incorporated with a capital of $100,000. The officers are John W. Brown, 509 Main street, Worcester, Mass., president; F. Austin Wilson, 294 Washington street, Boston, Mass., treasurer and clerk.

The Fairmont Foundry Co., Fairmont, W. Va., has been incorporated to do a general foundry business with a capital stock of $25,000. The incorporators are W. D. Goodwin, S. R. Holbert, John O. Morgan and others.

The Western Mfg. & Supply Co., Oakland, Cal., has been organized with a capitalization of $25,000 to carry on a general foundry, manufacturing and machinery business. The incorporators are James Normand, Marfa, Tex., Montroyd Sharp, H. C. Anderson and G. H. Normand, of Santa Cruz, and James H. Todd, of Berkeley.

The Raymond Foundry & Machine Co., Raymond, Wash., has been incorporated with a capitalization of $25,000 by Christopher Hanson, Ralph Gerber, Len E. Hunton and B. I. Jones.

The Lizzie Lowman Co., Sheffield, Ala., has been organized with a capitalization of $40,000 to manufacture stoves, ranges and McKay harrows. The incorporators are: B. J. Lowman, S. A. Lowman and J. L. Andrews.

The Payne & Joubert Co., whose large foundry and machine shops at East Birmingham, Ala., are now ready for operation, recently increased its capital stock from $100,000 to $150,000.

The Glascock Stove & Mfg. Co., Greensboro, N. C., has been incorporated with a capital stock of $100,000 by G. T. Glascock, T. A. Glascock, L. L. Glascock and others.

The Spalding-May Foundry & Machine Co., recently moved into its new plant at Atlanta, Ga., and will now employ a much larger force.

The Wisconsin Foundry Co., Milwaukee, Wis., has been incorporated with a capital stock of $20,000 by J. R. Smith, Albert E. Smith, and Gerhard Mockley.

The Racquette Foundry & Supply Co., of Potsdam, N. Y., has increased its capital stock to $15,000.

On June 9 the old J. L. Mott Iron Works in New York city was formally closed and all its activities transferred to the new plant of the company, which has been in course of construction for many months near Trenton, N. J.

The plant formerly owned and operated by Daniel M. Curry at Danville, Pa., has been sold by his heirs to a company formed by T. J. Price, F. H. Vannan, Clarence Haupt, Leonard Foulk, Robert G. Pursel, and Irvin Vannan, all of Danville, and all but two of whom have been actively connected with the plant for some time. The plant includes a foundry, pattern and machine shops and employs 125 men. R. G. Pursel will have charge of the office and Irvin Vannan will be general manager of the plant.

The Contractors' Tool Co., 704 Arch street, Philadelphia, has been incorporated to take over the business heretofore carried on under that name and to increase the capital and extend the business. Considerable foundry equipment will be purchased. C. P. Calver is manager.

The Globe Foundry Co., Cincinnati, O., has been incorporated with a capital of $10,000 by H. C. Kombrinck, August F. Zobel, Wm. J. Thieken, B. A. Hulswith and J. C. Baum Jr.

The Ohio Foundry & Mfg. Co., Steubenville, O., has been organized with a capitalization of $150,000 by George E. Sharpe, Alex. B. Sharpe, William L. Sharpe, M. S. McFadden and C. P. McFadden.

The D. T. Williams Valve Co., Cincinnati, O., has increased its capital stock from $100,000 to $200,000 to provide for the enlargement of its plant.

The Maumee Brass & Mfg. Co., Toledo, O., has been incorporated with a capital of $50,000, by Porter Paddock, Cecil D. Mackey, Chas. Fox, Arthur E. Rowley and H. C. Lamb. The company will manufacture brass and bronze fittings and aluminum castings, and will locate its plant in Toledo. It is reported that the new company will take over the business formerly conducted by the Toledo Bronze Co.

The Bellevue Pipe & Foundry Co., Bellevue, O., has been incorporated with a capital of $100,000, by H. D. Kellar, Thomas E. Robinson, C. B. Hoyt, A. W. Schwing and Jesse Vickery.

The capital stock of the Weber Foundry Co., Cincinnati, O., has been increased from $10,000 to $25,000. More than $10,000 will be spent in erecting an addition and installing improved machinery.

The Toledo Steel Foundry Co., Toledo, O., has been incorporated with a capital of $250,000, by H. A. Parsons and Chas. A. Parsons, of Cleveland, and C. H. Wilcox, H. H. Creighton and Chas. R. Clapp, of Toledo. Chas. A. Parsons will be general manager. The company will build and equip a plant with open-hearth steel furnaces which will have a capacity of about 12,000 tons of steel castings per year.

Michael Boesen has purchased an interest in the Rock River Mfg. Co., Dixon, Ill., and will take charge of the plant.

Index to Volume XXVIII.

February 1906 to August 1906.

Accounting, Foundry 354
" Foundry Costs 134
" Uniform Methods in Foundry 368
Air Furnace Bottoms in Malleable Practice 110
" Furnaces, Comparative Designs of 390
Alloys, A Talk on 326
Alloying, Practical 26-78-412
Aluminum in Cast Iron and Steel 174
Am. Foundrymen's Asso., Annual Meeting of .. 45
" " " Convention 177-193-244-271
" " " (Visitors Attending) .. 300
" " Supply Asso 286
Analysis of Iron, Report of Committee on 343
Angles, Cords of 173
Ash, Determination of in Coke 155
Associated Foundry Foremen, Convention of 274
Associations and Societies 52-119-194-247-352
Automobile, Brass and Bronze for 227
" Cylinder Water Jacketed 346
" Cylinders, Mixtures for 108
Babbitt Metal 90
" the Man and the Metal 220
Bed Plate, Casting a Large 68
Beds, Standard Method of Making 345
Bell, Casting a Church 163
Bells of the Denver Cathedral 80
Berkshire Molding Machine, Model of 240
Bevel Gear Teeth, Sawing of 169
Blow Holes and Phosphorus 115
" " in Gear Teeth 236
Blower, The Piqua Positive Foundry 241
Brass and Bronze for the Automobile 227
Brass Cylinders, Casting of 89
" for Chandeliers 415
" Foundry Notes 36-89-165-229-422
" Furnace, Getting Experience With a 223
" Skimmings, Reduction of 165
" Tablets 423
" Works, The Glauber 30
Brasses, Marine 160
British Foundry Notes 197-250-435
Bronze Castings, Some Old 156
" for the Automobile 227
Brown & Sharp Mfg. Co., Foundry Department of 1
Burden, Correct Application of to Iron Cost 354
Caldwell & Son Co., H. W., Foundry of 201
Carbon, Determination of in Steel 400
" " of Total 343
" Quick Determination of 401
Carnegie Technical School Foundry Starts 91
Cast Iron, Beneficial Effects of Ferro-Silicon on. 322
" " Notes 46-108-174-236-346-434
Casting a Church Bell 163
" A Large 68
" Brass Cylinders 89
" German Silver for Rolling 34
" One Half of a Wheel 15
Castings, Defective Gear 434
" Gating of Malleable 47
" Green Sand Steel 175
" Open-hearth Steel 16-72-150-211-399
" Small Output of Steel 175
" Some Old Bronze 156
Chandelier Work, Mixtures for 415
Chill, Failure of Iron to 434
Chilled Surface, Hardness of a 46
Chords of Angles 173
Cire-Perdue Process at a Roman Bronze Works. 417
Cleveland Club of Associated Pattern Maker Foremen 45
Commercial Management of Engineering Work (New Book) 167
Construction, New 57-122-200-259-372-440
Convention Notes 318
Core Coning Machine 113
" Machine, a Slab 432
" Practice 111
" Molding, Multiple 230
" Oil and Oil Cores 20
" Sands and Core Binders 216
Cores, T Slot 234
" Use of Nail 429
Coring in Name Plates 171
Cost Finding, Foundry 368
Costs, Foundry 134
Crucible Steel 183
Crucibles, A Use for Old 229
Cupola, A New Hot Blast 387
" Banking a 111
" Burning Out of Lining 346
" Fluxes in the 319
" Good Work in a 174
Curbing, a New Foundry 91
Cylinders, Mixtures for Automobile 108
Deaths 55-122-199-372-439
Denver Cathedral, The Bells of 80
Elevator, A Foundry 219
Eminent Engineers (New Book) 349
Engine Bed, Patterns for a Heavy 93
Exhibition of Foundry Equipment 293
Facing Mill, A 239
Ferro Silicon, Beneficial Effects of on Cast Iron. 322
Fires 56-122-199-259-372-439
Flask Pin, A 349
Fluor Spar as a Flux 432
" " The Use of Powdered 49
Fluxes for Alloys 412
" in the Cupola 319
Foaming Slag 237
Foundry Accounting 354
" Construction, Modern 208
" Cost 134
" Cost Finding 368
" Department of the Brown & Sharp Mfg. Co 1
" Department of the Ingersoll-Rand Co. 129
" Equipment, Exhibition of 293
" of the H. W. Caldwell & Son Co 201
" of the Isaac G. Johnson Co 63
" Plant of the Manufacturers' Foundry Co. 379
" Practice 7
" Practice, Dark Secrets in 362
Furnace Bottoms in Malleable Practice 110
" Getting Experience With a Brass 223
Furnaces, Comparative Designs of Air 390
Fuel Tests 116
Gear Castings, Defective 434
" Teeth, Blow Holes in 236
" Teeth, Sawing of Bevel 169-234
Gears, Iron Mixtures for 108
" Machine Molded Cast 407
General Industrial Notes 59-123-263-375-442
German and American Iron Production 242
" Silver, Casting for Rolling 34
Glauber Brass Works, The 30
Green Sand Steel Castings 175
Grinding Wheel Insurance 37
Gun Metal Rolls 416
Hawser Pipe Patterns 426
High-Melting Ratio 176
Ingersoll-Rand Co., Foundry Department of 129
Iron, Beneficial Effects of Ferro Silicon on Cast. 322
" Failure of to Chill 434
" Mixtures for Automobile Cylinders 108
" Mixtures for Gears 108
Johnson Co., Isaac G., Foundry Plant of 63
Lost Wax Process at the Roman Bronze Works. 417
McFadden, W. H., Pres. of the A. F. A 309
McPhail Molding Machine Co., Stripping Plate Molding Machine 49
Machine Molded Cast Gears 407
" Molding, Recent Methods of 364
Magnesium in the Brass Foundry 228
Magnet for Unloading Pig Iron 53
Magnetic Brake, A New 112
Malleable Cast Iron Notes 47-110
" Cast Iron Notes 47-347
" Castings, Gating of 47
" Iron, Making Half a Ton of 110
Manager's Troubles, The 66
Manganese, Determination of in Pig Iron 401
" Determination of in Steel 400
" Quick Determination of 401
Manufacturers' Foundry Co. of Waterbury, Conn., Description of 379

Index to Volume XXVIII.—Continued.

Manufacturing Opportunity, A Good..... 166
Marine Brasses..... 160
Melting Ratio, A High..... 176
Metals, The Boom in..... 243
Mitis Metal..... 109
Mixing Iron by the Right Map..... 238
Mixture for a Water Heater..... 422
" for Sand Rolls..... 46
" for Chandelier Work..... 415
Molds, Multiple..... 357
Molders, Good, Why Are They Scarce..... 356
Molding a Nine-Foot Valve..... 38
" Machine, A Handy..... 191
" Machine, A Stripping Plate..... 48
" Machine Model, A..... 240
" Multiple Core..... 230
" Recent Methods of Machine..... 364
" Sand..... 176
" Sand, Laboratory Examination of.... 327
" Sand, Study of..... 411
Multiple Molds..... 357
Nail Cores..... 429
Nailing Down Time..... 114
Name Plates, Coring in of..... 171
Open-hearth Steel Castings.....16-72-150-211-399
Pattern Maker Foremen, Cleveland Club of Associated.....45-173
Pattern Making, Practical (New Book)..... 49
" Shop Equipment..... 311
" Shop, The Tool Holder in..... 168
Patterns for a Nine-Foot Valve..... 38
" for Hawser Pipe..... 426
" for Heavy Engine Bed..... 93
Paxson Co., J. W., A Handy Molding Machine. 191
Perry Time Stamp..... 114
Personals..... 55-121-198-259-371-439
Phosphorus and Blow Holes..... 115
" Determination of in Coke..... 155
" Determination of in Pig Iron..... 401
" Determination of in Steel..... 400
" Quick Determination of..... 401
Piece Work, Effect of a Little in a Jobbing Foundry..... 70
Pig Iron, Analysis of Different Brands..... 11
" " Magnet for Unloading..... 53
Piqua Positive Foundry Blower..... 241
Plating, Trouble in..... 89
Polishing Belt, An Endless..... 166
Pompeiian Bronze Castings..... 156
Position and the Man, The..... 385
Practical Alloying..... 26-78-412
" Shop Work (New Book)..... 258
Pyrometer, A Low Resistance..... 252
Reamers, Taper..... 430
Roman Bronze Works, Cire-Perdue Process at. 417
Sand, Laboratory Examination of Molding..... 327
" Molding..... 176
" Rolls, Mixture for..... 46
" Study of Molding..... 411
Sawing Bevel Gear Teeth..... 169
" " " " 234
Scrap, Use of..... 8
Silicon, Determination of in Pig Iron..... 400
Skimmings, Reduction of..... 165
Slag, Foaming..... 237
Smoke Question, The..... 25
Souvenirs of the A. F. A. Convention..... 307
Spindle Collar, An Eccentric..... 44
Steel Casting, An Interesting..... 348
" Castings, Open-Hearth.....16-72-150-211-399
" " Small Output of..... 175
" Crucible..... 183
" Foundry Notes.....109-175
" Foundry of the Isaac G. Johnson Co.... 63
" Melting a Small Quantity of..... 176
" Physical Tests of..... 402
Sulphur, Determination of..... 344
" Determination of in Steel..... 400
Sweep, an Eccentric Collar for..... 44
Taper Reamers..... 430
Thermit, Process in the Foundry..... 370
Tool Holder in the Pattern Shop..... 168
Towne, Frederick T., Death of..... 54
Trade Outlook.....50-116-192-242-350-436
Trade Publications.....77-121-155-173-235-259-321-345-411-435
Traveling Crane, A Serviceable..... 25
Tumbling Barrel and Its Use..... 225
Valve, a Nine-Foot..... 38
Wheel, Casting One-Half of a..... 15
Wire, Melting of..... 422

Authors' Index to Volume XXVIII.

February 1906 to August 1906.

Barringer, R. "Crucible Steel"..... 183
Bole, Wm. A. "Foundry Practice"..... 7
Bristol, Wm. H. "A Low Resistance Thermo-electric Pyrometer"..... 252
Buchanan, John F. "Babbitt, the Man and the Metal"..... 220
Buchanan, John F. "Casting of Church Bell... 163
" " " "Gun Metal Rolls"..... 416
" " " "Marine Brasses"..... 160
" " " "Mixtures for Chandelier Work"..... 413
Buchanan, John F. "Practical Alloying"..26-78-412
Burns, Oscar W. "Getting Experience with a Brass Furnace"..... 223
Burns, Oscar W. "The Effect of a Little Piece Work on a Jobbing Foundry"..... 70
Burns, Oscar W., "The Position and the Man".. 385
Carr, W. M. "Developments of the 'Thermit' Process in the Foundry"..... 370
Carr, W. M. "Open-hearth Steel Castings"..... 16-72-150-211-399
Depont, H. B. "Brass and Bronze for the Automobile"..... 227
Diller, H. E. "Report of Committee on Standard Methods of Analysis"..... 345
Falconer, Kenneth. "Uniform Practice in Foundry Cost Finding"..... 368
Fernal, Jean. "Gating Malleable Castings"..... 47
Field, H. E. "Molding Sand"..... 176
Frohman, E. D. "Core Sands and Core Binders" 216
Grinder, A. F. "The Use of Powdered Fluorspar" 49
Hart, Dean. "The Bells of Denver Cathedral".. 80
Henemann, W. P. "Core Oil and Oil Cores".... 20
Hoy, John F. "Method for the Determination of Phosphorus in Ash and Coke"..... 155
Keep, W. J. "Cast Iron Notes"..... 46-108-174-236-346-434
Knowes, O. W. "The Manager's Troubles"..... 66
McCaslin, H. J. "An Eccentric Spindle Collar" 44
" " " "Chords of Angles"..... 173
" " " "Coring in Name Plate"..... 171
" " " "Hawser Pipe Patterns"..... 426
" " " "Multiple Core Molding"..... 230
McCaslin, H. J. "Patterns for a Heavy Engine Bed"..... 93
" " " "T Slot Cores"..... 234
" " " "The Use of Nail Cores"..... 429
McCune, John. "Mixing Iron by the Right Map" 238
McDowell, R. W. "Foundry Costs"..... 134
McQuilliam, W. S. "Good Molders, Why are they Scarce"..... 356
Moldenke, Dr. Richard. "Malleable Cast Iron Notes"..... 116
Moldenke, Dr. Richard. "Malleable Cast Iron Notes"..... 347
Mumford, E. H. "Recent Methods of Machine Molding"..... 364
Nau, J. B. "Steel Foundry Notes".....109-175
Outerbridge, Alex E. "The Beneficial Effects of Adding High Grade Ferro Silicon to Cast Iron"..... 322
Parry, Wm. H. "Dark Secrets in Foundry Practice"..... 362
Parry, Wm. H. "Sawing Bevel Gear Teeth".... 234
Ries, Prof. Heinrich. "The Laboratory Examination of Molding Sand"..... 327
Shed, N. W. "Fluxes in the Cupola"..... 319
" " " "Foaming Slag"..... 237
Shirley, Robert. "A Nine Foot Valve"..... 38
Taylor, E. M. "The Correct Application of True Burden to Iron Costs"..... 354
Townsend, David. "Modern Foundry Construction..... 208
Tuttle, H. N. "Taper Reamers"..... 430
" " " "The Tool Holder in the Pattern Shop"..... 168
Vickers, C. "A Talk on Alloys"..... 326
" " "Brass Foundry Notes"..... 35-89-165-229-422
Webb, James F. "Multiple Molds"..... 359
West, Ralph H. "Comparative Designs and Working of Air Furnaces"..... 390
Wheeler, N. A. "Sawing Bevel Gear Teeth".... 169
Zelde. "A New Hot Blast Cupola"..... 387

WE **SOLD** OVER

40,000

BARRELS FLOUR

in the past twelve months

Some one must be satisfied with the flour which they are getting, as well as the treatment accorded them, else we could not have done this amount of business.

We are pleased to announce that we are now in shape to do double the amount of the above business in the future, as we have largely increased the capacity of our plant.

The Piqua Flour Co.

PIQUA, OHIO, U. S. A.

Alphabetical Index to Advertisers.

Adams Co 18, 147
Addy, Matthew, & Co 158
Ajax Metal Co 152
Albany and North River Moulding Sand Co 142
American Air Compressor Works 156
American Blower Co 37
Arcade Mfg. Co 21
Atlas Car & Mfg. Co 139
Baird & West 159
Barnett, Oscar, Foundry Co 146
Bartlett, N. S., & Co 158
Berkshire Mfg. Co 17
Blackwell, Geo. G., Sons & Co 153
*Blake, Geo. F., Mfg. Co ..... —
Brandau, Adam 157
Brass Founders' Supply Co 147
Bridgeport Safety Emery Wheel Co 131
Bristol Co 150
Brown Specialty Machinery Co 22
Buffalo Foundry Supply Co 8
Burdick & Son 150
*Byram & Co ..... —
Carborundum Co 134
Case Mfg. Co 138
Caufman, S. H. 150
Cherry Valley Iron Co 42
Chicago Pneumatic Tool Co 40
Clark Cast Steel Cement Co 32
Cleve and Fillet Co 155
Columbus Iron & Steel Co 158
Connersville Blower Co ..... Back cover
Cornell, J. B. & J. M., Co 149
Crescent Phosphorized Metal Co 152
Crossley Mfg. Co., The 143
Curtis & Co. Mfg. Co 27
Dalton, Nash & Co 158
Dayton Pneumatic Tool Co 145
*Deane Steam Pump Co 150
DeCamp Bros. & Yule Iron, Coal & Coke Co 158
Diamond Clamp & Flask Co 147
Dimmick, J. K., & Co 158
Dings Electro Magnetic Separator Co 144
Dixon, Joseph, Crucible Co 38
Dobson, William 156
Dodge & Day 154
Domhoff & Joyce Co 158
Dresden Sand Company 157
Drucklieb, C 133
Elliot, Debevoise & Anderson 159
Elm City Engineering Co 144
Etting, Edward J 157
Fair, Taylor & Co 154
Falls Rivet & Machine Co 25
Fanner Mfg. Co 150
Field, Alfred & Co 151
Field, Robt, Sales Agency 159
Foundry Specialty Company 142
Fox Machine Co 134
Gautier, J H., & Co 44, 154
General Chemical Company 154
General Pneumatic Tool Co 139
Gilmour, J 140
Goldschmidt Thermit Co 141
Goodrich, F. A., & Co 158
Gregg Company 138
Gunn, Richards & Co 125
Hanna Engineering Works 29
Harbison-Walker Refractories Co 157
Harrington Son & Co., Edwin 137
Herman Pneumatic Machine Co 20
Hill & Griffith Co 5
Hillman, J. H., & Son 158
Holland Linseed Oil Co 128
Hooper, G. K 154
Ingersoll-Rand Co 35
Jones & Attwood 151
Keep, W. J 154
Kendall & Flick 152
*Kent Mfg. Co ..... —
Kilbourne & Jacobs Mfg. Co 145
Lang, R. F 153
Library Bureau ..... —
Lindsay, W. W., & Co 41
MacKellar's Sons Co 147
Macphail Molding Machine Co 16
Manning, Maxwell & Moore 136
Maris Bros 135
Maurer, Henry & Son 157
Maywood Foundry & Machine Co 19
McCormick, J. S., Co 9
McCullough-Dalzell Crucible Co 46
McKeefrey & Co 158
Metallurgical Laboratory 154
Mfg. Equipment and Engineering Co 140
Midvale Mining & Mfg. Co 149
Millett Core Oven Co 24
Mills, C. E., Oil Co 48
Mohr, J. J 158
Monarch Engineering & Mfg. Co 39
Moore's Facing Works 146
Moussette, O. J 143
Mumford, E. H. Co 12, 13
National Corundum Wheel Co 131
National Jeloluse Co 151
New Era Mfg. Co 153
Niles-Bement-Pond Co 135
Northern Engineering Works 136, 138
Norton Company 127
Norwalk Iron Works Co 159
Obermayer, S., Co ..... Inside front cover
Osborn Mfg. Co 129
Otis Steel Co 144
Pangborn, T. W. Co 7
Partamol Co 142
Pawling & Harnischfeger 137
Paxson, J. W., Co 2, 3, 4
*Pettinos Bros ..... —
Phosphor Bronze Smelting Co 152
Pickands, Brown & Co 159
Pickands, Mather & Co 159
Pike Manufacturing Co 129
Pilling & Crane 159
Piqua Flour Co 119
Piqua Foundry & Machine Co 149
Pridmore, Henry E 10, 11
Ransom Mfg. Co 133
Rathbone, John A 13
Republic Iron & Steel Co 43
Ridgway, Craig, & Son Co 28
Robeson Process Co 1
Rockwell Engineering Co 141
Roessler & Hasslacher Chemical Co 153
Rogers, Brown & Co 159, 160
Roots, P. H. & F. M., Co ..... Insert
Ross-Tacony Crucible Co 47
Seidel, R. B. Inc ..... —
Sellers, Wm., & Co 49
Shanafelt Mfg Co 31
Shelton Metallic Filler Co 30
Shepard, Chas. G 159
Shuster, F. B., Co 148
Sly, W. W., Mfg. Co 34
Smith, J. D., Foundry Supply Co 6
Smith & Caffrey Co 140
Smooth-On Mfg. Co 33
Standard Sand & Machine Co 143
Sterling Oil Co 151
Stevens, F. B 121, 123, 159
Stephens & Co 149
Stow Mfg. Co 131
Sturtevant, B. F., Co 36
*Surplus Coke Co 155
Tabor Mfg. Co 14, 15, 145
Taylor, Robert J., Inc 45
Thomas Furnace Co 159
Tilghman-Brooksbank Sand Blast Co 133
Turner Machine Co 134
Turner, Vaughn & Taylor Co 23
U. S. Chaplet Co 150
Vitrified Wheel Co 129
Walter-Wallingford & Co 159
Western Foundry Supply Co 155
Whiting Foundry Equipment Co 50
Wiener & Co., Ernst 139
Yale & Towne Co 26

ON TOP

It's the summit we are all striving for—sometimes it's a rugged pathway—but then it is worth the effort.

STEVENS' CARBON BLACKING

is on top. It has been tried on large cylinders and the sand rolled off like the water from the proverbial duck's back.

It "peels" any casting, no matter how difficult, when used on either loam or dry sand, and gives equally good service as a core wash.

Where it is used the "cleaners" and "chippers" have time to spare.

It mixes readily, remains in solution, applies easily, and saves time all around. Just let me prove this by sending one package for nothing, or one barrel on approval.

Can give references if you want them. "Everything for a Foundry."

Facing Mill Isabella Ave. @ M. C. R. R. Tracks.

FREDERIC B. STEVENS,

DETROIT, MICH.

Office: Corner Larned @ Third Streets.

CLASSIFIED

BUYERS' DIRECTORY

Advertisers' names are inserted under this heading at the rate of four classifications to each page advertisement carried regularly.

Abrasive Materials:
Carborundum Company, Niagara Falls.
Norton Emery Wheel Co., Worcester.

Accountants.
Gunn, Richards & Co., New York.
Library Bureau, Systematizing Dept., Boston.

Air Compressors:
American Air Compressor Works, New York.
Chicago Pneumatic Tool Co., Chicago.
Curtis & Co. Mfg. Co., St. Louis.
Ingersoll-Rand Co., New York.
Norwalk Iron Works Co., So. Norwalk, Conn.

Alloys:
Blackwell Sons & Co., Geo., Ltd., Liverpool, Eng.
New Era Mfg. Co., Kalamazoo, Mich.
Phosphor Bronze Smelting Co., Ltd., Philadelphia.

Analysis—Mechanical:
Keep, W. J., Detroit.

Analysis—Chemical:
Metallurgical Laboratory, Pittsburg.

Anchors:
Lindsay & Co., W. W., Philadelphia.

Babbitt Metal:
Ajax Metal Co., Birmingham, Ala.

Barrels—Steel:
Kilbourne & Jacobs Mfg. Co., Columbus.

Blowers:
American Blower Co., Detroit.
Connersville Blower Co., Connersville, Ind.
Cornell Co., J. B. & J. M., New York.
Monarch Engineering & Mfg. Co., Baltimore.
Roots Company, P. H. & F. M., Connersville, Ind.
Sturtevant Co., B. F., Boston.

Blowers—Positive Pressure:
Connersville Blower Co., Connersville, Ind.
Piqua Foundry & Mch. Co., Piqua, O.
Roots Company, P. H. & F. M., Connersville, Ind.
Sturtevant Co., B. F., Boston.

Brushes:
Osborn Mfg. Co., Cleveland.

Buildings (Struct. Steel):
Lindsay & Co., W. W., Philadelphia.

Burners (Oil):
Monarch Engineering & Mfg. Co., Baltimore.

Carbonese:
Midvale Mining & Mfg. Co., E. St. Louis, Ill.

Castings (Steel):
Otis Steel Co., Ltd., Cleveland.

Cement (Furnace):
Dixon Crucible Co., Jos., Jersey City.
Gautier & Co., J. H., Jersey City.

Cement (Metallic):
Clark Cast Steel Cement Co., Shelton, Conn.
Shelton Metallic Filler Co., Derby, Conn.
Shanafelt Mfg. Co., Canton, O.
Smooth-On Mfg. Co., Jersey City.

Chaplets:
Burdick & Son, Albany.
Fanner Mfg. Co., Cleveland.
Lindsay & Co., W. W., Philadelphia.
U. S. Chaplet Co., New York.

Coke:
Rogers, Brown & Co., Cincinnati.
Surplus Coke Co., New York.

Cores:
Brown Specialty Machry. Co., Chicago.

Core Binders:
Holland Linseed Oil Co., Chicago.
Millers' Products Co., Chicago.
Mills Oil Co., C. E., Syracuse.
National Jeloluse Co., New York.
Robeson Process Co., Camden, N. J.
Sterling Oil Co., Emlenton, Pa.

Core Machines:
Brown Specialty Machry. Co., Chicago.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Jones & Atwood, Stourbridge, Eng.
Kent Mfg. Co., Kent, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

Core Tapering Machines:
Brown Specialty-Machinery Co., Chicago.

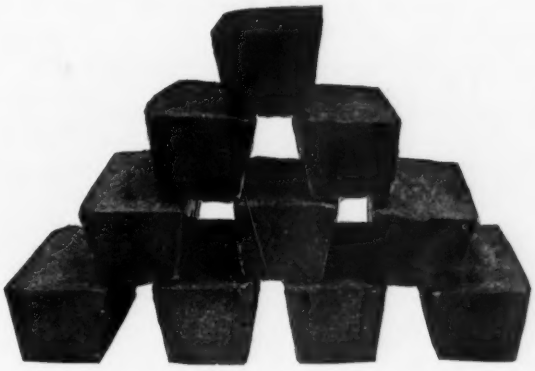
Core Ovens:
Atlas Car & Mfg. Co., Cleveland.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Millett Core Oven Co., Brightwood, Mass.
Paxson Co., J. W., Philadelphia.
Pangborn Co., Thos. W., New York.
Smith Foundry Supply Co., J. D., Cleveland.

Core Oven Recording Thermometer:
Bristol Co., Waterbury.

Cost Keeping Systems.
Gunn, Richards & Co., New York.
Library Bureau, Systematizing Dept., Boston.

Cranes:
Case Mfg. Co., Columbus, O.
Curtis & Co. Mfg. Co., St. Louis, Ill.
Manning, Maxwell & Moore, New York.
Maris Bros., Philadelphia.
Niles-Bement Pond Co., New York.
Northern Engrng. Works, Detroit.
Pawling & Harnischfeger, Milwaukee.
Ridgway & Son, Craig, Coatesville, Pa.
Sellers & Co., William, Inc., Philadelphia.
Whiting Foundry & Equipment Co., Harvey, Ill.

Continued on page 124



TRIPOLI COMPOSITION

The kind that has made its own record in actual service. Once used, always used. Not the cheapest in the beginning, but at the end.

I manufacture a complete line of Polishing and Plating Compositions.

PURE POWDERED CHARCOAL

Ground and bolted through silk mesh. The finest on the market. It is used here by the manufacturing pharmacists in the making of charcoal tablets. Good evidence of its purity.

Stove Plate Manufacturers, Brass Founders use it and call for more.

FREDERIC B. STEVENS,

Manufacturer

Polishers', Platers' and Founders' Supplies.

DETROIT, MICH.

Crushers and Pulverizers:
Moussette, O. J., Brooklyn.

Crucibles:
Dixon Crucible Co., Jos., Jersey City.
Fair, Taylor & Co., San Francisco.
Gautier & Co., J. H., Jersey City.
McCullough-Dalzell Crucible Co., Pittsburg.
Monarch Engineering & Mfg. Co., Baltimore.
Paxson Co., J. W., Philadelphia.
Ross-Tacony Crucible Co., Philadelphia.
Seidel, R. B., Inc., Philadelphia, Pa.
Taylor, Robt. J., Inc., Philadelphia.

Cupolas:
Byram & Co., Detroit.
Gilmour, J., New York.
McCormick Co., J. S., Pittsburg.
Northern Engnrng Works, Detroit.
Paxson Co., J. W., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Linings:
McCormick Co., J. S., Pittsburg.
Paxson Co., J. W., Philadelphia.

Curbing (Foundry):
United States Steel Piling Co., Chicago.

Elevators:
Curtis & Co. Mfg. Co., St. Louis.
Ridgway & Son, Craig, Coatesville, Pa.

Engines (Gas):
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

Engines (Steam):
American Blower Co., Detroit.
Sturtevant Co., B. F., Boston.

Engineers (Foundry, Mech., Elec., &c.):
Dodge & Day, Philadelphia.
Hooper, Geo. K., New York City.
Lindsay & Co., W. W., Philadelphia.

Facings:
Buffalo Foundry Supply Co., Buffalo.
Dixon Crucible Co., Jos., Jersey City.
Hill & Griffith Co., Cincinnati.
R. MacKellar's Sons Co., Peekskill, N. Y.
McCormick Co., J. S., Pittsburg.
Obermayer Co., S., Cincinnati.
Paxson Co., J. W., Philadelphia.
Pettinos Bros., Bethlehem, Pa.
Smith Foundry Supply Co., J. D., Cleveland.
Stephens & Co., Kidwelly, Eng.
Stevens, F. B., Detroit.
Western Foundry Supply Co., E. St. Louis, Ill.

Fans:
American Blower Co., Detroit.

Ferro-Manganese:
Kendall & Flick, Washington, D. C.
Rogers, Brown & Co., Cincinnati.

Ferro-Silicon:
Roessler & Hasslacher Chemical Co., New York.
Rogers, Brown & Co., Cincinnati.

Fillers (Metallic):
Clark Cast Steel Cement Co., Shelton, Conn.
Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City.

Fillets:
Cleveland Fillet Co., Cleveland, O.

Fire Brick:
Gautier & Co., J. H., Jersey City.
Maurer & Son, Henry, New York.

Fire Sand:
Carborundum Co., Niagara Falls, N. Y.

Flasks:
Adams Co., Dubuque, Ia.
Barnett Fdy. Co., Oscar, Newark.
Brass Founders' Supply Co., Newark.

Flasks (Snap):
Adams Co., Dubuque, Ia.
Diamond Clamp & Flask Co., Richmond, Ind.
Obermayer Co., S., Cincinnati.
Smith & Caffrey Co., Syracuse, N. Y.

Flour:
Piqua Flour Co., Piqua, O.

Foundry Equipment (Iron & Brass):
Barnett Fdy. Co., Oscar, Newark.
Etting, Edward J., Philadelphia.
Obermayer Co., S., Cincinnati.
Pangborn Co., Thos. W., New York.
Sly, W. W. Mfg. Co., Cleveland.
Stevens, F. B., Detroit.
Taylor, Robert J., Inc., Philadelphia.

Foundry Supplies:
Buffalo Fdy. Supply Co., Buffalo.
Caufman, S. H., Chester, Pa.
Fair, Taylor & Co., San Francisco.
Hill & Griffith Co., Cincinnati.
McCormick Co., J. S., Pittsburg.
Obermayer Co., S., Cincinnati.
Osborn Mfg. Co., Cleveland.
Pangborn Co., Thos. W., New York.
Paxson Co., J. W., Philadelphia.
Smith Foundry Supply Co., J. D., Cleveland.
Stevens, F. B., Detroit.
Taylor, Robert J., Inc., Philadelphia.

Furnaces (Melting):
Barnett Foundry Co., Oscar, Newark, N. J.
Monarch Engineering & Mfg. Co., Baltimore.
Paxson Co., J. W., Philadelphia.
Rockwell Engineering Co., New York.

Grinding Machinery:
Adams Co., Dubuque, Ia.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
National Corundum Wheel Co., Buffalo.
Norton Co., Worcester.
Ransom Mfg. Co., Oshkosh, Wis.

Grinding Wheels:
National Corundum Wheel Co., Buffalo.
Norton Co., Worcester.
Pike Mfg. Co., Pike, N. H.
Vitrified Wheel Co., Westfield, Mass.

Continued on page 126

The Cost of It

The expense of a modern system of cost-keeping need be no greater than a crude, antiquated and inefficient way of keeping accounts.

Such a system is accurate, quick and in ample detail, and it gives the detailed costs of every part of the work while the business is fresh—when it is most valuable as a basis of comparison.

We have studied cost-keeping very carefully and have installed systems which meet these requirements in many well-known foundries.

Will you accord us an interview?

GUNN, RICHARDS & COMPANY

Production Engineers and Public Accountants.....

43 WALL STREET, 43 EXCHANGE PLACE, } NEW YORK — 50 CONGRESS STREET, BOSTON

224 ST. JAMES STREET, MONTREAL

Grinding Pans:
Crossley Mfg. Co., Trenton, N. J.

Hammers (Pneumatic Chipping):
Dayton Pneumatic Tool Co., Dayton, O.
Ingersoll-Rand Co., New York.

Heating & Ventilating Apparatus:
American Blower Co., Detroit.
Sturtevant Co., B. F., Boston.

Hoists:
Curtis & Co., Mfg. Co., St. Louis.
General Pneumatic Tool Co., Montour Falls. N. Y.
Harrington Son & Co., Edwin, Philadelphia.
Niles-Bement-Pond Co., New York.
Northern Engrg. Works, Detroit.
Pawling & Harnischfeger, Milwaukee.
Sellers & Co., Inc., William, Philadelphia.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York.

Hoists (Pneumatic):
Ridgway & Son, Craig, Coatesville, Pa.

Hydrofluoric Acid:
General Chemical Co., Philadelphia.

Industrial Ry. Equipment:
Atlas Car & Mfg. Co., Cleveland.
The Gregg Company, Ltd., Newburg, N. Y.
Wiener & Co., Ernst, New York.

Iron Ore:
Rogers, Brown & Co., Cincinnati.

Lacquers:
New Era Lustre Co., New Haven.

Ladles:
Northern Engrg. Works, Detroit.

Lights (Portable):
Wells Light Mfg. Co., New York.

Molding Machines:
Adams Co., Dubuque, Ia.
Arcade Manufacturing Co., Freeport, Ill.
Berkshire Mfg. Co., Cleveland.
Herman Pneumatic Machine Co., Zelienople, Pa.
McPhail Molding Machine Co., Davenport, Ia.
Manning, Maxwell & Moore, New York.
Maywood Foundry & Machine Co., New York.
Mumford Co., E. H., Philadelphia.
Paxson Co., J. W., Philadelphia.
Pridmore, Henry E., Chicago.
Tabor Mfg. Co., Philadelphia.
Turner Machine Co., Philadelphia.

Oil (Linseed):
Holland Linseed Oil Co., Chicago.

Packing (Rubber Sheet):
Smooth-On Mfg. Co., Jersey City.

Parting Materials:
Foundy Specialty Co., Cincinnati.
Imperial Fluxing Co., Marion, Ky.
Partamol Co., New York.

Patterns (Metal & Wood):
Herman Pneumatic Machine Co., Zelienople, Pa.

Pattern Shop Equipment:
Fox Machine Co., Grand Rapids, Mich.

Phosphorizers:
McCullough-Dalzell Crucible Co., Pittsburg.

Phosphor Tin:
Crescent Phosphorized Metal Co., Philadelphia.
Lang, R. F., New York.
New Era Mfg. Co., Kalamazoo.

Pig Iron:
Addy & Co., Mathew, Cincinnati.
Baird & West, Detroit.
Bartlett & Co., N. S., Boston.
Cherry Valley Iron Co., Pittsburg.
Columbus Iron & Steel Co., Columbus.
Dalton, Nash & Co., New York.
De Camp Bros. & Yule, St. Louis.
Dimmick & Co., J. K., Buffalo.
Domhoff & Joyce Co., Cincinnati.
Elliott, Debevoise & Anderson, New York.
Field Sales Agency, Robert, Cincinnati.
Goodrich & Co., F. A., Detroit.
Hillman & Son, J. H., Pittsburg.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., Philadelphia.
Pickands, Brown & Co., Chicago.
Pickands, Mather & Co., Cleveland.
Pilling & Crane, Philadelphia.
Republic Iron & Steel Co., Pittsburg.
Rogers, Brown & Co., Cincinnati.
Shepard, Chas. G., Buffalo.
Stevens, F. B., Detroit.
Thomas Furnace Co., Milwaukee.
Walter-Wallingford & Co., Cincinnati & Pittsburg.

Plumbago:
Dixon Crucible Co., Jos., Jersey City.
Gautier & Co., J. H., Jersey City.
Hill & Griffith Co., Cincinnati.
McCullough-Dalzell Crucible Co., Pittsburg.
Obermayer Co., S., Cincinnati.
Pettinos Bros., Bethlehem, Pa.
Ross-Tacony Crucible Co., Philadelphia.
Stevens, F. B., Detroit.

Polishers' & Platers' Supplies:
Stevens, F. B., Detroit.

Riddles:
Adams Co., Dubuque, Ia.
U. S. Chaplet Co., New York.

Sand:
Albany and North River Molding Sand Co., Albany, N. Y.
Buffalo Fdy. Supply Co., Buffalo.
Dresden Sand Co., Dresden, O.
Paxson Co., J. W., Philadelphia.
Pangborn Co., Thos. W., New York.
Standard Sand & Machine Co., Cleveland.
Stevens, F. B., Detroit.

Sand Blast Machinery:
Drucklieb, C., New York.
Pangborn Co., Thos. W., New York.
Tilghman-Brooksbank Sand Blast Co., Philadelphia.

Continued on page 128.

NORTON COMPANY

Formerly

NORTON EMERY WHEEL CO.

WORCESTER, MASS.

MANUFACTURERS OF

Norton Grinding Wheels

CHANGE IN NAME

As our wheels are now
made exclusively of

ALUNDUM

and emery does not enter into their composition, we have decided to eliminate the word emery from our name, so that in the future we shall be known as

NORTON COMPANY

ALUNDUM The Latest and Best Abrasive.

NORTON COMPANY

Worcester, Mass.

Sand Mixing Machinery:
Falls Rivet & Machine Co., Cuyahoga Falls, O.
Pangborn Co., Thos. W., New York.
Sellers & Co., Inc., William, Philadelphia.
Standard Sand & Machine Co., Cleveland.

Sand Sifters:
Deane Steam Pump Co., Holyoke, Mass.
Hanna Engrg. Works, Chicago.
Herman & Son, Chas., Sharpsburg, Pa.
Standard Sand & Machine Co., Cleveland.

Saws (Cold Cutting):
Tabor Mfg. Co., Philadelphia.

Seacoal:
Hill & Griffith Co., Cincinnati.
Obermayer Co., S., Cincinnati.
Paxson Co., J. W., Philadelphia.

Separators (Magnetic):
Dings Electro Magnetic Sep. Co., Milwaukee.
Elm City Engineering Co., New Haven.
Pangborn Co., Thos. W., New York.

Shafting (Flexible):
Stow Mfg. Co., Binghamton, N. Y.

Shoes (Molders' Fireproof):
Brandau, Adam, Detroit.

Shop Equipment:
Mfg. Equipment & Engineering Co., East Boston, Mass.

Shovels:
Stevens, F. B., Detroit.

Silica Wash:
Buffalo Fdy. Supply Co., Buffalo.

Sprue Cutters:
Barnett Fdy. Co., Oscar, Newark.
Shuster Co., F. B., New Haven.

Stoppers:
McCullough-Dalzell Crucible Co., Pittsburg.
Ross-Tacony Crucible Co., Philadelphia.
Taylor, Robert J., Inc., Philadelphia.

Stove Trimmings:
Burdick & Son, Albany, N. Y.
Fanner Mfg. Co., Cleveland.

Testing Machines:
Keep, W. J., Detroit.

Thermit Process:
Goldschmidt Thermit Co., New York.

Tools (Molders'):
Dobson, William, Canastota, N. Y.
Obermayer Co., S., Cincinnati.
Smith Foundry Supply Co., J. D., Cleveland.

Tools (Pneumatic):
Dayton Pneumatic Tool Co., Dayton.
Ingersoll-Rand Co., New York.

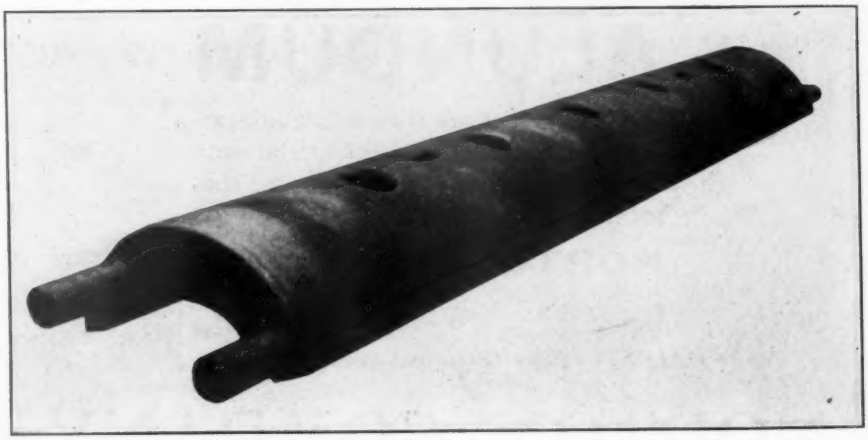
Tumbling Mills:
Adams Co., Dubuque, Ia.
Falls Rivet & Mch. Co., Cuyahoga Falls, O.
Gilmour, J., New York.
Sly, W. W. Mfg. Co., Cleveland.

Wax Wire:
Field, Alfred & Co., New York City.

Wire Straighteners:
Shuster Co., F. B., New Haven.
Blake Mfg. Co., Geo. F., New York City.

Holland Liquid Core Compound

IS THE CORE BINDER YOU NEED.



This core weighs 650 lbs. and is made with all Holland Oil. It is surrounded with 2,200 lbs. of iron, and are being made at the Tarrant Foundry Co., Chicago. They are baked over night in coke ovens. This core is made for a steam chest Laundry Mangle, and for the Troy Laundry Machinery Co., and is mixed with a sharp bank sand, same kind as is used in plaster for building purposes, and is mixed at the rate of 50 parts of sand to one of oil. We refer you to the Tarrant Foundry Co., H. L. O. Co., by permission.

Holland Linseed Oil Company 683-5 Austin Avenue CHICAGO, ILL.

Supplied in all required shapes and sizes.

New 64-page catalogue on application.

Pike Corundum Wheels

Made of the purest, highest grade Corundum obtainable.

FOR FOUNDRY USE AND TOOL GRINDING

COOL, FREE AND FAST CUTTING

Send for price-list and souvenir paper weight, blotter and sharpener.

Pike Mfg. Co., Pike, N. H.

Every user of a Pike Corundum Wheel is insured against accident by the Casualty Company of America.

PURE CORUNDUM WHEELS

Will by actual test wear longer, cut faster and give results far superior to any wheels on the market. A trial will convince that this statement is correct.

Trial orders solicited.

The Vitrified Wheel Co.,

Westfield, Mass.

INCREASE YOUR PROFITS

By using

"ECONOMY"

Steel Wire Wheel Brushes

The most successful Wire Wheel Brush ever made With it, one man can do more work and do it better than five men by hand methods. Thousands in use everywhere. Ask for economy booklet No 111. It tells all about the money saving qualities of ECONOMY WHEEL BRUSHES.

THE OSBORN MANUF'G CO.

CLEVELAND, O.

BRUSHES AND BROOMS

FOUNDRY SUPPLIES

UNDISPLAYED ADVERTISEMENTS

WANTED and FOR SALE

Undisplayed advertisements will be inserted under this head at 40 cents per line each insertion.

BLOWER BARGAINS.
Roots Second-Hand Blowers, bought, sold or exchanged for new ones. Address,
H. M. PAPWORTH,
120-122 Liberty Street, New York City.

FOR SALE.—A number of International Time Recording Clocks and Racks; good condition, almost new. Address, Room No. 1610, First National Bank Bldg., Chicago, Ill.

FLUOR SPAR.—Lump and Gravel. Special Qualities. Delivered Eastern Ports. Enquiries solicited. DRABBLE BROS., Mineral Merchants, Matlock, England.

FLUOR SPAR.—Every grade. Quotations delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or agents Penna. Salt Mfg. Co., Pittsburg, Pa.

Our very high-grade Fluor Spar will certainly produce higher tensile strength and cleaner castings than without its use. Less breakage in thin castings, such as iron pipe, etc., is assured. Using moderate amounts regularly in cupola charges will produce such results. We should be glad to give "facts" on Fluor Spar as a flux in foundry practice. ROBERTS & CO., Carthage, Tenn.

FOR SALE.—A first-class modern malleable iron foundry with full equipment. All buildings and machinery in the best condition and ready for operation. Foundry has a large capacity and is ideally located at Columbus, Ohio. Has always enjoyed a flourishing business, but must be sold at once, owing to a change in a future business of present owner. For full particulars address inquiry to Room No. 608, Union National Bank Bldg., Columbus, Ohio.

FOR SALE.—2 Colliau cupolas, capacity 5 to 7 tons of melted iron per hour. First class condition. Address Studebaker Bros. Mfg. Co., South Bend, Ind.

FOR SALE.—Well equipped Foundry and Machine shop, 100 miles from Chicago, in Illinois city of 17,000. This shop is full of work for six months, melting 4 to 5 tons daily. Address Box 700, THE FOUNDRY, Cleveland, O.

A BUSINESS OPPORTUNITY of exceptional value. A manufacturing proposition in the Birmingham, Ala., district requiring additional working capital of $15,000 or $20,000. Address Box 693, THE FOUNDRY, Cleveland, O.

A company in Chicago, who has a small well equipped grey iron foundry, desires to rent building and plant. Light and power furnished. Owners can purchase 3 to 4 tons of castings daily. Good opportunity for those desiring to go into this business. For full particulars address Box 699, THE FOUNDRY, Cleveland, O.

FOR SALE.—Bronze and brass foundry in a growing city of 50,000 people, in the center of a large coal field. Established twenty years. Foundry 30 x 60, smelting room 20 x 25, with four furnaces. Reason for selling poor health. Address Box 692, THE FOUNDRY, Cleveland, O.

FOR SALE:—Well equipped foundry and machine shops in mining district of 30,000 inhabitants. Owner wishes to retire. Address Box 545, THE FOUNDRY, Cleveland.

FOR SALE.—Large foundry located in Ohio. For full information address Box 669, THE FOUNDRY, Cleveland, Ohio.

FOR SALE.—Well equipped foundry and machine shop in Kentucky city with 30,000 inhabitants, three rivers and five railroads. Always has all the work it can handle. For further particulars address Box 707, THE FOUNDRY, Cleveland, O.

FOR SALE.—One No. 10 Buffalo forge blower, down discharge, and one No. 5 Baker blower, almost new. Will sell cheap. Address C. G. Howe, 40 Boyd Ave., Jersey City.

FOR SALE.—One (1) 36 inch Colliau cupola, first-class condition. One (1) No., 4½ Baker Rotary Blower, first-class condition. Both cupola and blower will be sold cheap. Apply BIRMINGHAM IRON FOUNDRY, Derby, Conn.

FOR SALE.—Second-hand positive pressure blower, suitable for foundry work. LAMSON CONSOLIDATED STORE SERVICE CO., 161 Devonshire St., Boston, Mass.

FOR SALE.—Schwartz 32" Furnace in first class shape, will guarantee as good as new. We had to buy a larger one. Address Box 714, THE FOUNDRY, Cleveland, O.

FOR SALE.—Brass and bronze foundry located at Detroit, Mich. Splendid opportunity. Address Box 720, THE FOUNDRY, Cleveland, O.

FOR SALE.—At a bargain—one 5-ton jib crane, made by the Whiting Foundry & Equipment Co. Practically as good as new. Address WM. A. HARDY & SONS CO., Fitchburg, Mass.

WANTED.—Two second-hand cupolas, in good condition, shells about 48 to 70 inches. Address Box 706, THE FOUNDRY, Cleveland, O.

WANTED.—A second-hand Whiting cupola, number 3½, 4 or 5—in good condition. RACINE BRASS & IRON CO., Racine, Wis.

HELP WANTED.

Undisplayed advertisements will be inserted under this head at 25 cents per line each insertion.

WANTED.—Assistant foreman for foundry in the Pacific Northwest. Must be competent, up-to-date and capable of handling men. Light and heavy work. Young married man preferred. Fine opportunity for the right man. Address Box 685, THE FOUNDRY, Cleveland, O.

WANTED.—Thoroughly competent man of good executive ability to serve as foreman of a general jobbing foundry, making gray iron, brass and bronze castings. Address, giving references and stating experience and lowest wages, Box 682, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Foundry foreman in live southern seaport town, 40,000 population. Must be first-class all round founder; one who would invest small amount in business preferred. Good pay. Fine chance for right man. Address Box 681, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Foreman for pattern shop. Must be able to take charge of wood and metal pattern departments. None but a high class man wanted. Address, stating salary wanted and give experience with references in confidence, Box 661, THE FOUNDRY, Cleveland, O.

WANTED.—First-class moulders on wood-working machinery castings; steady employment for good sober men. Apply H. B. SMITH MACHINE COMPANY, Smithville, Burlington County, N. J.

CONTINUED ON PAGE 132

THE ONLY MANUFACTURERS IN THE UNITED STATES OWNING AND OPERATING THEIR OWN MINES
THE NATIONAL CORUNDUM WHEEL CO.
BUFFALO N.Y.

Pure Corundum Wheels

Pure Adamite Wheels

Pure Emery Wheels

FOR ALL CLASSES OF WORK.

Made upon receipt of order to suit your individual wants. Write for Price List, Testimonials and Scientific Safety Test made by one of the Leading Universities.

The National Corundum Wheel Co.

3010 Main Street, BUFFALO, N. Y.

Motor Driven Swing Frame Grinder

Large range of movement or any angle. Wheel 16 x 2. Special belts.

A money saver.

Write us.

The Bridgeport Safety Emery Wheel Co. (Inc.)

Bridgeport, Conn.

ESTABLISHED 1875.

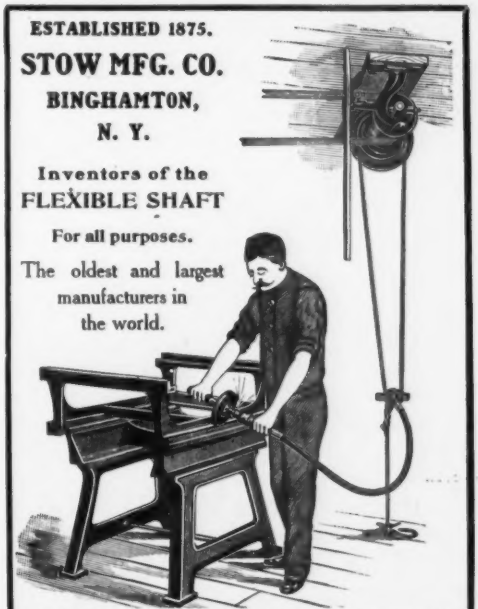
STOW MFG. CO.

BINGHAMTON, N. Y.

Inventors of the FLEXIBLE SHAFT

For all purposes.

The oldest and largest manufacturers in the world.



PORTABLE EMERY GRINDER

Take the tool to the work and save heavy handling.

Write us for Catalogue and Prices.

General European Agents: Messrs. Selig, Sonnenthal & Co., 85 Queen Victoria St., London, Eng.

THE COMPETENT LIFE

Thos. D. West's latest work

A treatise on the judicious development, direction and employment of man's inherited ability.

Deals with the modern industrial problems.

Price $1.25

The Penton Publishing Co.

CLEVELAND

FOUNDRY FOREMAN WANTED.—One who has had experience on agricultural implement or light work. Must be capable of handling seventy molders on benches and molding machines. Good position for right man. State fully, age, experience and salary expected. Address Box 680, THE FOUNDRY, Cleveland, Ohio.

WANTED.—Superintendent for crucible steel casting plant. Must be capable of taking entire charge of mixing and melting. Plant now running and full of orders. In reply give references, salary wanted and how soon you can take hold. Also state if you have your own mixtures and for what purposes. Address Box 717, THE FOUNDRY, Cleveland, O.

WANTED.—Capable foreman to take charge of brass foundry. One having experience in plumbers' brass work preferred. Write, stating experience had and salary expected. Address Box 710, THE FOUNDRY, Cleveland, O.

WANTED.—Foundry foreman, dry, loam, sand and house work; must be able to handle fifty men and get results. RIVERSIDE IRON WORKS, Kansas City.

WANTED.—To correspond with up-to-date, hustling, sober young man, experienced to design, construct and operate melting end of small steel casting foundry, stating age and experience. Address Box 709, THE FOUNDRY, Cleveland, O.

WANTED.—Two (2) strictly temperate non-union steel moulders for a new organizing small steel foundry in northern Ohio. One to be an active foreman and the other to be confined to the floor. A chance given each to have an interest in the firm. Opportunities unexcelled. References asked and given. Address Box 716, THE FOUNDRY, Cleveland, O.

WANTED.—Foundry foreman near New York City. Old established business, 12 to 20 moulders. Loam, dry and green sand, jobbing work. State fully, age, experience, where employed and salary expected. Must be non-union and have A 1 references as to ability and character. To the right party who is able to fill the bill would be given an opportunity to acquire stock in the company at a reasonable figure. All correspondence strictly confidential. Address Box 711, THE FOUNDRY, Cleveland, O.

WANTED.—First-class moulders, experienced in steel foundry practice. Union wages $3.75 per day of nine hours. Also two first-class coremakers at $3.50 per day. COLUMBIA ENGINEERING WORKS, 10th and Johnson streets, Portland, Ore.

WANTED.—Working foundry foreman for open shop. Address CAPITAL IRON WORKS, Topeka, Kansas.

WANTED.—Patternmakers in San Francisco. First-class men for jobbing shop. Wages $4.00 to $4.25 a day, nine hours work. Steady employment. No labor trouble, but non-union men preferred. Address R. F. HOEHNER, 814 1st Ave., Evansville, Ind.

WANTED.—A foundry foreman for a new, modern shop at present casting from 10 to 15 tons daily. Must be capable of working from drawings and have nerve and ability to handle men to the best advantage. Young man preferred. Address with references, stating age, to Box 724, THE FOUNDRY, Cleveland, O.

WANTED.—A foundry clerk capable of looking after shipping and keeping of general foundry records. Young man capable of reading drawings preferred. Address Box 725, THE FOUNDRY, Cleveland, O.

POSITIONS WANTED

Undisplayed advertisements will be inserted under this head at 25 cents per line each insertion.

SERVICES together with $2,000 to $6,000 to invest in profitable foundry by experienced man of 32. Nothing but a first class proposition which will bear closest investigation, considered. Address Box 678, THE FOUNDRY, Cleveland, O.

WANTED.—Position as foundry foreman. Twenty years' experience on all classes of work. Country shop in the East preferred. Accustomed to handling market order. Good references. Address Box 684, THE FOUNDRY, Cleveland, O.

POSITION WANTED.—Foreman patternmaker, wood and metal, A1 draughtsman and designer of molding machines, jigs, dies and tools, 12 years' experience agricultural machinery, desires change. First class references. Address Box 703, THE FOUNDRY, Cleveland, O.

WANTED.—Position as foreman in gray iron foundry. Thoroughly conversant with up-to-the-hour methods and appliances; 18 years' experience; familiar with machines; perfect in cupola practice; best of references. Address Box 691, THE FOUNDRY, Cleveland, O.

Energetic manager or superintendent, thoroughly familiar with gray iron work, seeks change of position. Experienced in modern office systems; also up-to-date factory methods. Address Box 718, THE FOUNDRY, Cleveland, O.

POSITION WANTED.—By a core foreman of fifteen years' experience in malleable work. Practical and experienced in piece work and cost of production. At present employed in large malleable plant. Desires a change where work will be appreciated and chance for promotion good. Address Box 712, THE FOUNDRY, Cleveland, O.

Young, ambitious, practical moulder, with technical education and experience in drafting and chemical work, wishes position to assist superintendent of large iron or steel foundry. Address Box 705, THE FOUNDRY, Cleveland, O.

FOUNDRYMEN.—Practical man, 28, wishes to change position. Nine years' experience with a foundry manufacturing malleable, gray and steel castings. Has been traveling for last four years Capable of filling any position. Address Box 708, THE FOUNDRY, Cleveland, O.

POSITION WANTED by thoroughly experienced German foundryman, 45 years of age. A member of the National Founders' Association. Fully acquainted with green or dry sand, loam and coremaking; also patternmaking. Good mixer of iron and capable of handling men. Good references. Would like charge of machinery, engine or architectural iron foundry in an open shop. Address Box 719, THE FOUNDRY, Cleveland O.

SUPERINTENDENT.—Aggressive and diplomatic, with a record of 18 years' good practical experience in the production of large and varied lines of metal products, desires a change. Thoroughly familiar with every detail of modern foundry practice (gray, mall., or steel). An organizer of help that produces permanent and satisfactory results. Some of the best references in the country to prove it. Address Box 713, THE FOUNDRY, Cleveland, O.

FOUNDRY FOREMAN.—With 22 years' experience on stove plate, heater and boiler work (match plate and machine) is open for an engagement after August 1. Well up in cupola practice. Can handle men to good advantage. Best of references. Address Box 715, THE FOUNDRY, Cleveland, O.

WANTED POSITION by young energetic foundry foreman of experience and temperate habits. Well up on light and heavy castings. Expert with molding machines. Address Box 704, THE FOUNDRY, Cleveland, O.

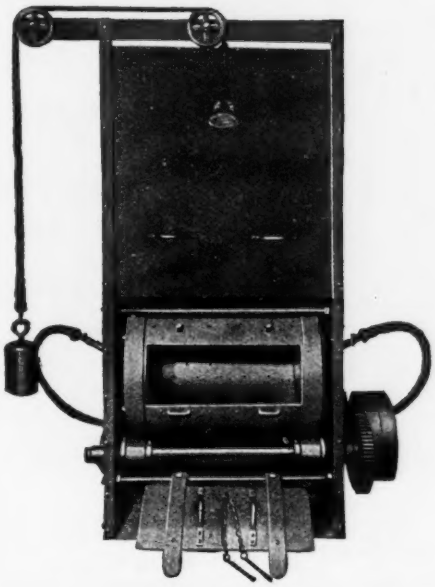
WANTED.—Position as superintendent or foreman of gray iron foundry. Thoroughly practical and up to date in all departments. Best of references. Address Box 727, THE FOUNDRY, Cleveland, O.

WANTED.—Position as assistant superintendent in foundry, or position as foundry chemist. Technical graduate. Two years as foundry foreman. At present employed. Address Box 722, THE FOUNDRY, Cleveland, O.

WANTED.—Position by a practical foundryman with fifteen years' experience in dry and green sand and chilled castings. Can handle mixtures by analysis or grading. Good executive ability, strictly temperate and forty years of age. Further particulars and references upon request. Address Box 723, THE FOUNDRY, Cleveland, O.

SITUATION WANTED.—Foundry foreman, experienced in marine and stationary engines and jobbing, iron and brass mixing and melting, ten years foreman. Address Box 721, THE FOUNDRY, Cleveland, O.

Sand Blast Tumbling Barrel



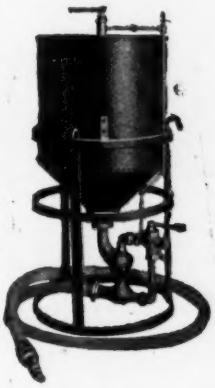
There is nothing uncertain in the action of this machine. Every particle of grit is removed from castings in one-half or less time taken by other means. The brief time and slow movement required combine to preserve the sharpness of outline and materially lessen breakage in castings of fragile form. Don't deny yourself information which will lead to larger profits.

Let us send you details.

Tilghman - Brooksbank Sand Blast Co.

1126 South 11th St., PHILADELPHIA, PA.

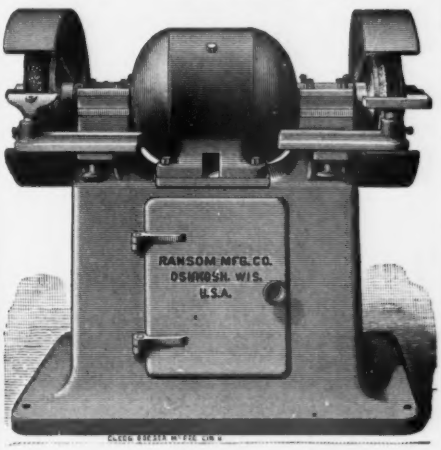
The Injector Sand Blast Apparatus.



If Interested in Efficient, Quick, and economical Cleaning of Castings, Write for Circular to

C. DRUCKLIEB,
132 Reade St., New York.

MOTOR DRIVEN DRY GRINDERS



FOR FOUNDRY USE

RANSOM MFG. CO.
OSHKOSH - - - - WIS.

AS A FURNACE LINING

There is nothing yet discovered that is quite the equal of Carborundum Fire Sand. Foundrymen and others who have used it declare that it is easier to apply —that it lasts longer—that it is more satisfactory every way than any other furnace lining they have ever used.

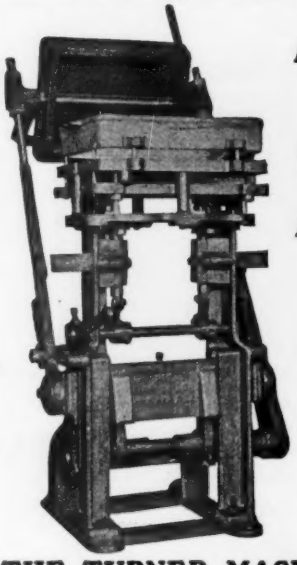
Carborundum Fire Sand is not affected by the action of acids or gases. It is highly infusible and more lasting than other furnace linings.

If you'll send us a sample order and give Carborundum Fire Sand a fair trial we are satisfied you will never want to use any other furnace lining.

The Carborundum Company NIAGARA FALLS New York

J. W. JACKMAN & Co., LTD.
39 Victoria St., London, S. W. Eng.
Agents for this material in Great Britain.

Molding Machines



Automatic Cock Grinders

Automatic Key-Lathes

Write for Illustrated Catalogue.

THE TURNER MACHINE CO.
2049 North Second Street
Philadelphia, Pa.

Pattern Shop Equipment

Complete Outfits

FOX UNIVERSAL TRIMMERS,
BAND SAWS, LATHES,
PLANERS, SAW BENCHES, ETC.

Have you seen our Fillet and Core Vent Press?

FOX MACHINE CO.
850 N. Front St., Grand Rapids, Mich.

Niles 30 and 40 ton cranes with 5 ton auxiliary hoists 62 ft. span. National Steel Foundry Co., New Haven, Conn.

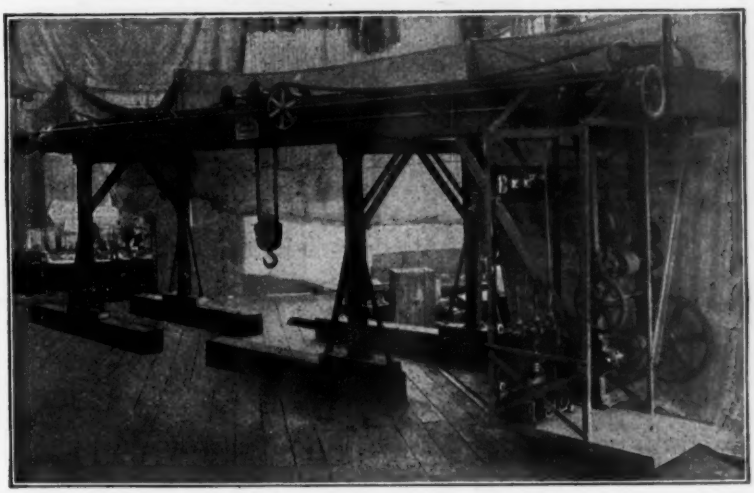
NILES CRANES

NILES-BEMENT-POND CO.

111 Broadway, NEW YORK, U. S. A.

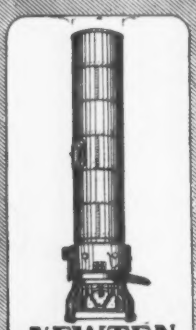
Philadelphia Boston Chicago Pittsburg St. Louis London

FOUNDRY CRANE



Where the head room is limited and the ladle of hot metal comes close up to the bridge, it is desirable to keep the hoist and motor away from the heat. In addition to the usual automatic electric and mechanical brakes the hoist is provided with a hand brake which gives absolute control of the lifting speed from full speed with a full load, to a few inches a minute for drawing patterns.

MARIS BROS., Philadelphia, Pa.



Foundry Machinery

"NORTHERN MAKE"

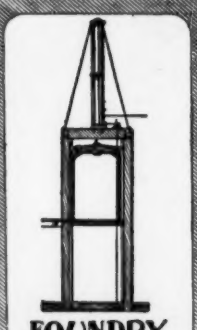
Is the make that always gives satisfaction to the practical foundryman.

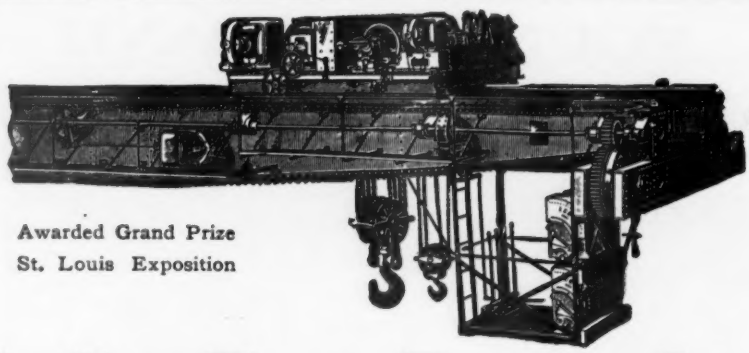
WELL MADE - WELL FINISHED

Bulletins on Request

Northern Engineering Works

4 Chene St., DETROIT, MICH.





Awarded Grand Prize
St. Louis Exposition

The Shaw Electric Traveling Crane

Manufactured by
The Shaw Electric Crane Company
Muskegon, Michigan

These Cranes are designed for use in POWER PLANTS, FOUNDRIES, MACHINE SHOPS, ETC. They are constructed with few parts and are therefore simple and exceedingly accessible. Workmanship and materials are of the very best and all operating parts are interchangeable

Send for Catalogue

Sole Agents **MANNING, MAXWELL & MOORE, Inc.** Sole Agents

65-67-69 Liberty Street, New York.

22-24-26-28 So. Canal St. CHICAGO | 721 Arch St. PHILADELPHIA | Frisco Bldg. ST. LOUIS | 128 Oliver St. BOSTON | Park Bldg. PITTSBURG | Williamson Block CLEVELAND

PAWLING AND HARNISCHFEGER

MILWAUKEE, WIS.

CRANES AND ELECTRIC HOISTS

Specially adapted for FOUNDRY service and Perfect Regulation

AWARDED
GRAND PRIZE AND GOLD MEDAL
at the
Louisiana Purchase Exposition.

Operating Expenses Vanish

when your castings are handled by Peerless Hoists.

They are always ready and can be operated by any workman.

They are faster and work easier and smoother than any hoist yet produced. PEERLESS HOISTS have fewer strands of chain than any other hoists of equal capacities.

If you have to move them about you will find them lighter in weight and more compact but without a sacrifice of strength.

Try one on your hardest work—it is their best recommendation.

Edwin Harrington Son & Co., Inc.

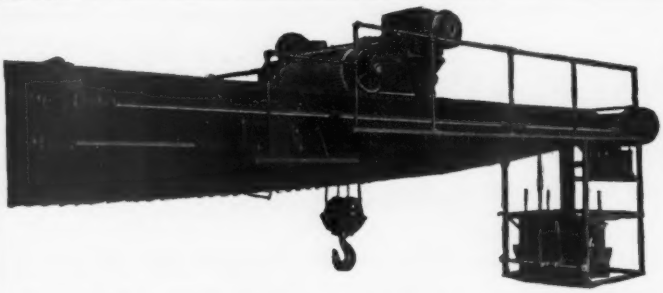
PHILADELPHIA, PA.

NORTHERN CRANES

THE IDEAL CRANES FOR THE MODERN FOUNDRY

NORTHERN ENGINEERING WORKS

4 CHENE ST., DETROIT, MICH., U.S.A.



Electric and Hand Power

CRANES

A. C. or D. C. MOTORS.

THE CASE MFG. CO., COLUMBUS, OHIO.

THE GREGG COMPANY, Ltd.

NEWBURGH, N. Y., U. S. A.

June, 1906

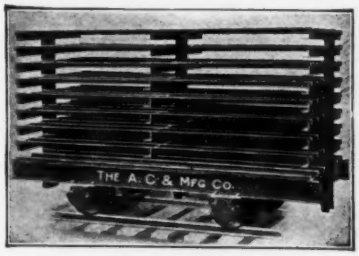
DEAR SIRS: Please send us your catalog "H" describing foundry railway equipment, cranes, overhead tramrail systems and trollies, stating WHY they are better than other makes---you agreeing to write us no follow up letters.

Yours very truly,

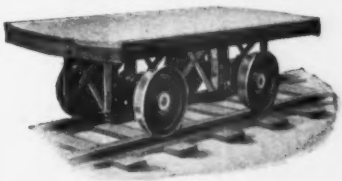
.....

.....

.....



No. 231-A
Core Oven Car



No. 2025
Radial Truck
General Purpose Car
Made in sizes to order

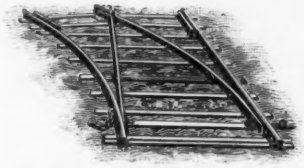
The Atlas Car & Mfg. Co.

CLEVELAND, OHIO.

Manufacturers of

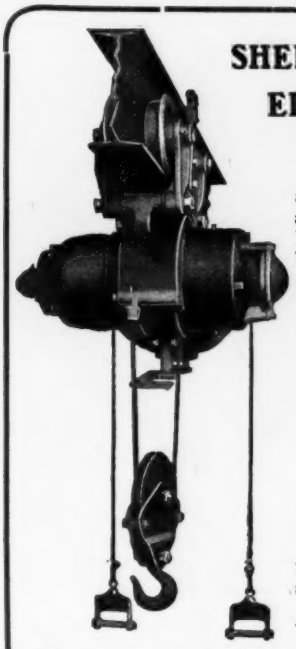
Small Cars of all kinds for various purposes, Sand Buckets, Turntables, Rails, Frogs, Switches, Etc.

Foundry Equipment a Specialty.



No. 1010
One Way Left Hand Switch
Foot Throw

No. 145-C
Steel Top Ball Bearing
Turntable



SHEPARD ELECTRIC HOISTS

are especially adapted to Foundry Duty by the

ABSOLUTE SAFETY

CLOSE SPEED CONTROL

and

MAXIMUM HEADROOM

which the design affords.

Ask for Bul. 56

The Genera Pneumatic Tool Co.

New York Singer Bldg. | General Office and Wks. Montour Fall, N. Y. | Philadelphia Stephen Girard Bldg.

INTERCHANGEABLE CRANE AND BUGGY LADLE

Built in capacities of from 2,000 to 8,000 lbs., and in sizes of from 28" gauge to standard gauge. We also carry a LARGE STOCK of Cars, Rails, Track, Turntables, Frogs, Switches.

Foundry Equipment a Specialty.

Send for Catalog No. 21-P.

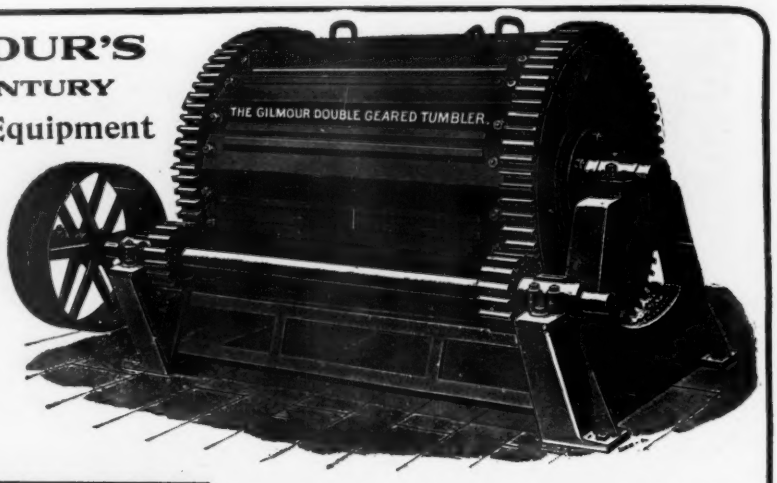
ERNST WIENER CO.,

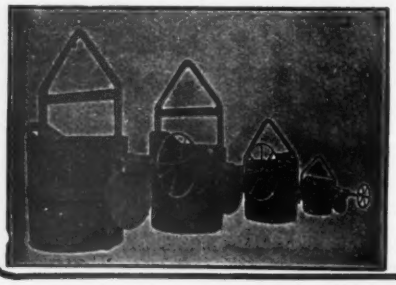
Works, Youngstown, O. 66-68 Broad St., N.Y.

Gazette Bldg., Pittsburg | 37 Farnsworth St., Boston

GILMOUR'S
20th CENTURY
Foundry Equipment

CUPOLAS
TUMBLERS
TRUCKS
CRANES
LADLES





Gilmour's Double Spur-Geared Tumbler

is the longest-lived and most practical mill ever put on the market. Let us tell you more about it.

J. GILMOUR
Bennett Building **New York**

"A TWENTIETH CENTURY NECESSITY"

SANITARY WASH BOWLS

Clean, compact and practical. Individual galvanized or enameled metal bowls. Single or double batteries. Complete equipments ready to connect with cold, tempered or hot and cold water supply. Send for catalog.

Mfg. Equipment & Engineering Company
299 Marginal Street, East Boston, Mass.

Manufacturers of Improved Metal Factory Furniture, Soda Kettles, Metal Frame Stools and General Shop Equipment.

All Sizes
One Price

Quick
Deliveries

Machine Lock Corners
Malleable Iron Trimmings
Selected Kiln Dried Oak or Cherry
Oak $2.50 **Cherry $3.50**

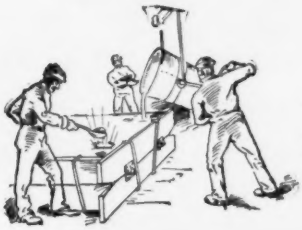
Manufactured by

SMITH & CAFFREY CO.
Successors to C. H. Green & Co.,
Syracuse, N. Y.

"THERMIT"

(Trade Mark Registered.)

helps the expert foundryman to overcome many difficulties hitherto beyond his control. Thermit reaction produces 5400° F. anywhere in half a minute without heat or power from outside, and separates out liquid steel.



THERMIT REVIVES DULL IRON OR STEEL

in ladles or risers preventing cold-shuts and other defects resulting from dull metal. Titan Thermit increases fluidity and assures tough, close-grained castings.

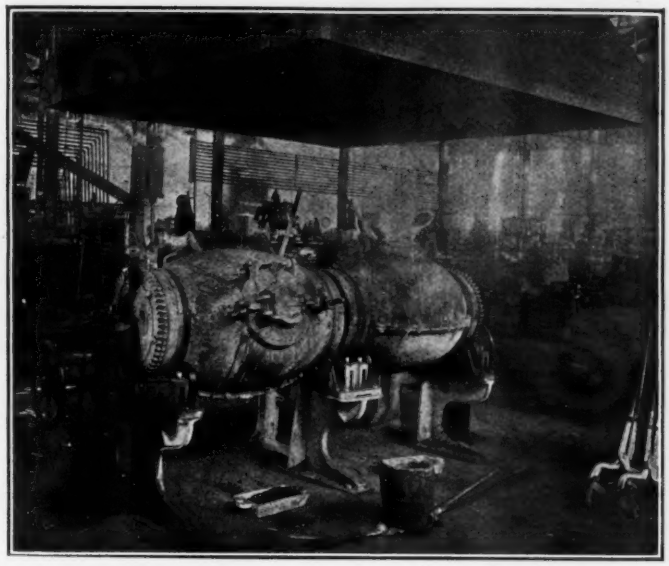
THERMIT REPAIRS FLAWS

in castings and forgings. The intensely hot steel washes out the defective area replacing it with pure steel. Saves much waste.

It will pay you to investigate the manifold uses and advantages of Thermit.

Send for our valuable pamphlets.

GOLDSCHMIDT THERMIT CO., 43 Exchange Pl., New York City.



The Rockwell Saves

Where Others Waste.

Metal Melted at a cost of from 6 to 12 cents per 100 lbs.

Can't we send you one of our Double Chamber Melting Furnaces on approval?

WE MAKE CORE OVENS, LADLE HEATERS, ANNEALING & WHITE METAL POT FURNACES. *Write for Catalog*

ROCKWELL ENGINEERING CO., NEW YORK.

Fine Albany Sand

We are furnishing the BEST Fine Sand that the Albany district ever produced. Ask your neighbor. Unequaled grades for Stove-plate, Brass, and Bench work. Our Medium and Coarse is just as good, None Better.

Albany & North River Molding Sand Co.
ALBANY, N. Y.

FOR PARTING MOLDS

PARTAMOL

THE PROFIT PRODUCER

"Success means willingness to put aside the old for something better."

Partamol is the "something better" in parting compounds. It turns out a perfect mold with every line true to pattern. Allows of easy and perfect "slicking" of the mold. The results from its use will astonish you. The price will please. Sample on request. Ask your jobber.

THE PARTAMOL COMPANY, 605 Broadway, New York.

Partine
THE UNIVERSAL PARTING

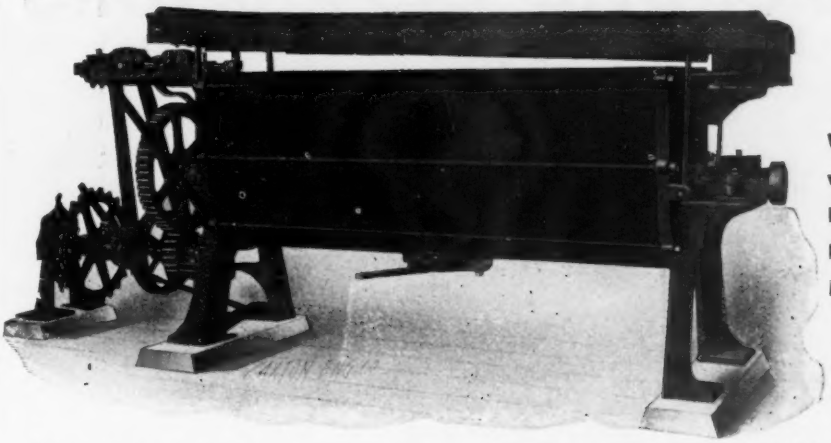
The Best in the Market

BECAUSE it saves time;
BECAUSE it saves labor;
BECAUSE it saves money;
BECAUSE it produces a pattern-true casting.

Write at once for sample, booklet and full particulars.

The Foundry Specialty Co., Cincinnati, O.

THE STANDARD SAND MIXER AND SCREEN COMBINED.

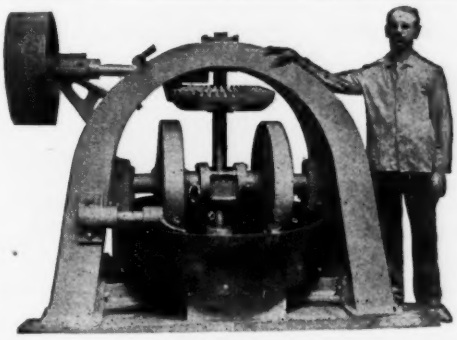


With or without Direct Motor Attached

Adapted to Oil Core or any kind of foundry mixing. Made in 5 sizes, capacity from 1 to 15 tons per hour. Three fourths of labor saved, one half of the mixtures used saved, as compared with Screen, Centrifugal and Shovel process. Adopted by the leading foundries in this and foreign countries.

Ask for Catalogue and List of Users.

The Standard Sand & Machine Company,
Cleveland, Ohio.
Manufacturers of Sand Mixing and Labor-Saving Machinery.



This four foot Dry Pan

For iron and steel foundries in mixing, grinding and tempering sand, clay, etc., is the heaviest and most substantially built machine. Furnished with any size mesh of screen plates desired. Motor or belt drive.

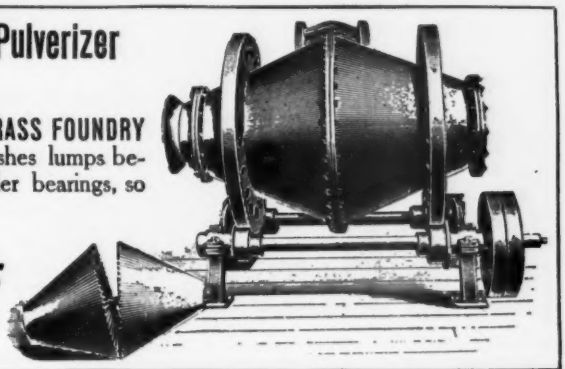
WRITE FOR MORE DETAILED DESCRIPTION.

THE CROSSLEY MFG. CO.
TRENTON, N. J.

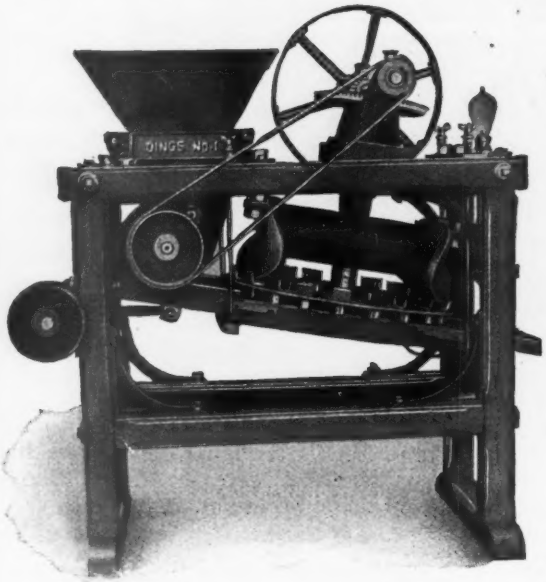
The Monarch Crusher and Pulverizer
(New Principle)

For the reclaiming of Metal from **BRASS FOUNDRY ASHES,** Cinders, Skimmings, etc. Crushes lumps between jaws of ball. Barrel is on roller bearings, so takes little power. Run wet or dry.

MANUFACTURED BY
O. J. MOUSSETTE
466-468 Driggs Ave.,
BROOKLYN, N. Y.



MAGNETIC SEPARATORS



TYPE M, NO. 1, METAL SEPARATOR.

—FOR—

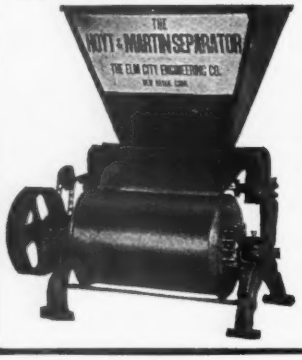
Iron Foundries,
Brass Foundries,
Metal Refining,
Mining, Etc.

We build magnetic separators exclusively and our machines are kept strictly up-to-date.

Various kinds and sizes to meet any requirement. We are now building more magnetic separators than any other concern in the world.

DINGS ELECTRO-MAGNETIC SEP. CO.

Milwaukee, Wis.



Magnetic Separator

If you want the Best Separator made, which will extract iron from brass or any other substance.—Write to us.

THE ELM CITY ENGINEERING CO.
65 Orange St., New Haven, Conn., U. S. A.

Eastern Agents
Edward J. Etting,
Harrison Bldg.,
Philadelphia, Pa.

Pacific Coast Agents
Berger, Carter & Co.,
150 Beale Street,
San Francisco, Cal.

Foreign Agents
Mountain & Gibson, Ltd.
Bury, (Lancashire)
England.

OTIS STEEL

"Otis" Fire Box Plates a Specialty

FLANGE PLATES, SHIP PLATES, TANK PLATES, STEEL CAR AXLES, AND FORGINGS OF ALL KINDS

Steel Castings from 100 to 100,000 lb.

Head Office and Works, CLEVELAND, O.

Agencies: NEW YORK, Thorpe, Platt & Co., 97 Cedar St.
MONTREAL Homer Taylor, 183 St. James St.
DETROIT, George W. House, Union Trust Building.
SAN FRANCISCO, John Woodlock, 154-156 First St.

THE TAYLOR-NEWBOLD SAW
PATENTED
INSERTED TEETH IN THIS SAW TREATED UNDER EXCLUSIVE LICENSE BY THE TAYLOR-WHITE PROCESS.
MFD. & SOLD EXCLUSIVELY BY
THE TABOR MF'G. CO.
PHILA. U.S.A.

Steel Foundries

The Taylor-Newbold Saw

Cuts three times as fast and lasts three times as long as any other saw without regrinding.

Cuts Any Carbon.
Removable Cutters.
Easily Sharpened.

The Tabor Manufacturing Co.
PHILADELPHIA, PA.
28 South Canal Street,
CHICAGO, ILL.

GREEN PNEUMATIC HAMMERS

Built in all styles and sizes. Furnished with inside or outside trigger.

SENT ON TRIAL.

THE DAYTON PNEUMATIC TOOL CO.
DAYTON, O. CHICAGO, ILL.

STEEL SHOP BARRELS

For Foundries, Factories, Machine Shops, etc. Intended for carting and storing heavy fittings, castings, parts of valves, etc.

SIZE—18 inches diameter, depth 28 inches. Shell made from single sheet of No. 16 gauge steel, having only one riveted side seam. Bottom stamped from a single plate of No. 8 gauge steel, to form flange 1 inch deep, which is riveted to the shell and with a 1 inch corrugation 6 inches from the center, barrel bound at top with 1½ x ⅜-inch steel. Painted black outside. Weight 50 pounds each. Open at top; not water tight. Other sizes made to order.

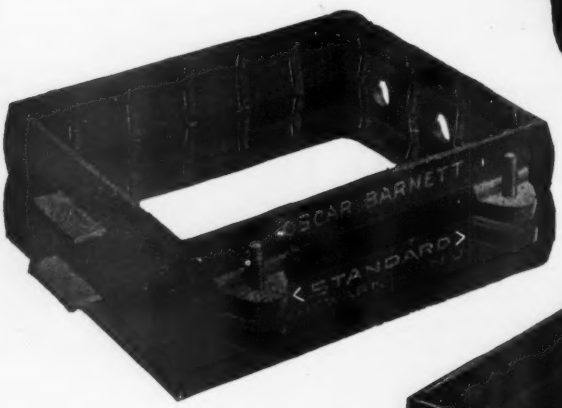
Write for prices and information to

The Kilbourne & Jacobs Mfg. Co.
Columbus, Ohio.

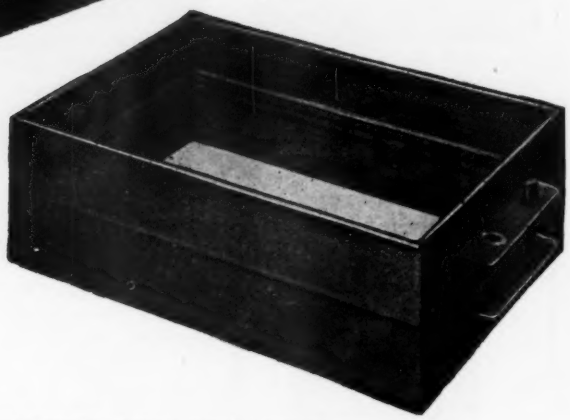
Brass Molders' Flasks

Of Every Style and Size

Furnaces, Drying Stoves, Spill Troughs, Clamps, Boards, Tongs, Crucibles, etc., etc.



All our flasks interchange with any of same size made by us.



Our own foundries ensure prompt shipments.

THE OSCAR BARNETT <STANDARD> FLASK IS MADE ONLY BY

Oscar Barnett Foundry Co.

Founded 1845 **NEWARK, N. J., U.S.A.**

The Adams Snap Flask

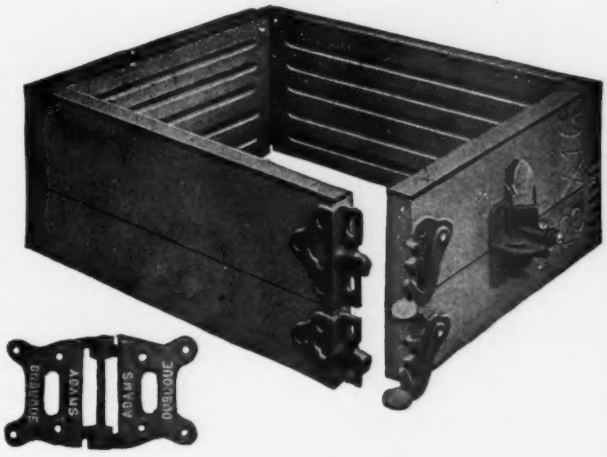
Selected Dry Cherry
1 1-16 inches thick, is used in our flasks which alone costs more than all of the material used in the ordinary flask.

Corners
of the flask are machine locked, giving greater surface for gluing and a stronger joint than is possible to obtain from a dovetail or mitre.

Trimmings
are of malleable iron. The snaps are without doubt the quickest snaps to operate.

Top Irons
which protect the edges of both cope and drag are ⅛ x 1 inch wrought iron with WELDED CORNERS, which make the flask more rigid.

Pins and Ears
of malleable iron, with ¾ inch milled bearing on each side of the right angle. Fine adjustment in both ears is provided by means of a screw on the ends of the ears Both ears being adjustable, cope and drag are easily kept in line.



THE ADAMS COMPANY
Dubuque, Iowa, U. S. A.

- FLASKS -

FOR ALL KINDS OF WORK

BENCH FLOOR MACHINE

Our PATENTED IMPROVED Rib Flask has Imitators but no Equals

BRASS FOUNDERS SUPPLY CO., Newark, N. J.
Modern Equipment for Brass Foundries

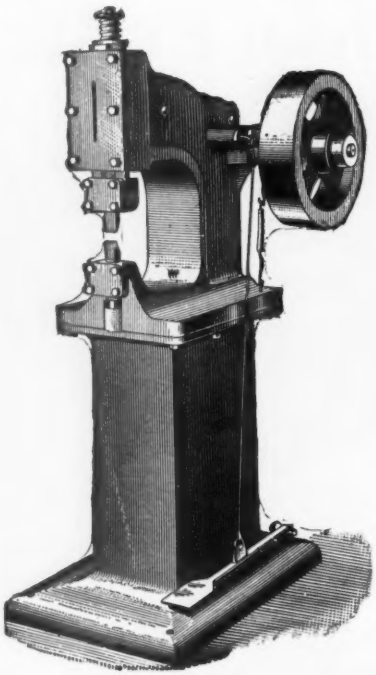
WE MANUFACTURE AND MAKE A SPECIALTY OF
FOUNDRY FLASKS
OF ALL KINDS.
Send your orders direct to us. Snap Flasks of all kinds,—straight side, taper, cut and round, right or left hand.
DIAMOND CLAMP & FLASK CO., Richmond, Ind., U.S.A.

MacKELLAR'S CHARCOAL FACINGS
Cannot be excelled

Pine Charcoal for Stove, Plate, Charcoal facing for general foundry use, Brass founders parting charcoal or any other sort desired.

THE PEEKSKILL FACING MILLS
Estab. 1844 Incorp. 1902

Address: R. MacKellar's Sons Co
Peekskill, N. Y.



Don't Hesitate

to invest in whatever saves labor.
Every blow of the hammer on the chisel in the old chip, chipping away way of cutting gates from castings, trims down the margin of profit.

A Shuster
Power or Foot Lever
Sprue Cutter

operated by one man will do more than a dozen men can in the hammer and chisel way and the castings will be trimmed cleaner and closer.
We make a specialty of building automatic labor saving machinery.

Catalogue for the asking.

F. B. Shuster Co.
Formerly John Adt & Son.
New Haven, Conn.

"ABC" OF IRON

A practical book for FOUNDRY FOREMEN

It contains the real serviceable information such as you need. No foundryman can afford to be ignorant of the nature and properties of iron.

READ THAT CONTENTS AND CONSIDER ITS VALUE TO YOU.

In a good cloth binding
118 Pages. Price $1.00

For sale by
The Penton Publishing Co.
CLEVELAND

CONTENTS

IRON—WHAT IS IT?
A description of the metal and its uses, showing in what combinations it is found and the principal sources.

PIG IRON
An account of the blast furnace process by which the ores are reduced to pig iron.

CONSTITUENTS OF IRON
A description of the elements in pig metal which influence cast iron. Described in chapters on Carbon in Cast Iron; Phosphorus in Cast Iron; Silicon in Cast Iron; Manganese in Cast Iron; Sulphur in Cast Iron.

NUMBERING OF PIG IRON
Showing the character and analysis of different grades of pig iron, appearance of fracture and the uses to which the several grades are adapted.

GRADING OF IRON
Should it be by analysis or by fracture?

HOW TO REDUCE COST OF MIXTURE

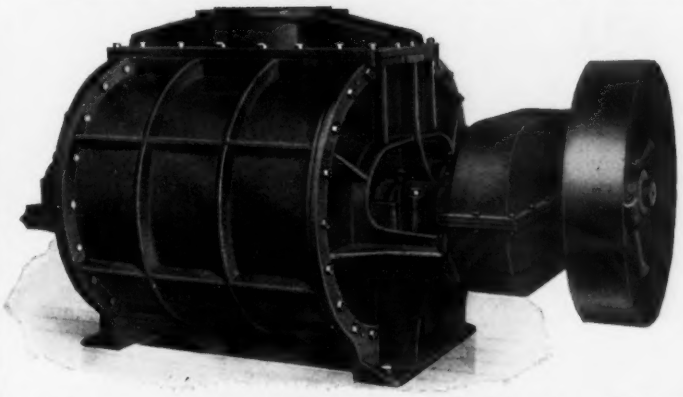
STEEL

PHYSICAL PROPERTIES OF METALS DEFINED
Table of shrinkage of castings. Weights of castings from patterns, etc.

STATISTICS
Showing the varieties and production of iron ore, pig iron, pig iron and steel products, railroad mileage and equipment, etc., etc., etc.

EARLY HISTORY AND MANUFACTURE OF IRON
Brief history of the manufacture and uses of iron from earliest times, being principally extracts from Mr. James M. Swank's "HISTORY OF IRON IN ALL AGES."

"THE PIQUA" POSITIVE FOUNDRY BLOWER



Simplicity

Highest Efficiency

Built on CORRECT PRINCIPLES from entirely

NEW IDEAS

NEW DESIGNS **NEW PATTERNS** and are **STRICTLY UP-TO-DATE**

Extremely Simple in Construction and Operation, occupying Smallest Floor Space. Guaranteed Superior. ***Prices Right***

It's up to you to write for information. Bulletin F 10. It's Free.

THE PIQUA FOUNDRY & MACHINE CO.
PIQUA, O.

The perfect softening alloy for Cast Iron. Used in the ladle.

TRADE MARK

Carbanese

REG. U. S. PAT. OFF.

Softens, Strengthens, Improves grain and tooling quality. Eliminates Sulphur. Prevents blow-holes.

Order direct and avoid Substitution.

MIDVALE MINING & MFG. CO.
SOLE MANUFACTURERS, **East St. Louis, Ills.**

By Using

Stignic Paint

for steel moulders, castings strip easily with very clean skins.

Labor Saved.
Better Castings.

Agent required, must be in a good position and in touch with Steel Founders.

STEPHENS & CO.

Kidwelly, England

A PERFECT CHAPLET

Will never cause the loss of a casting. The rusty or poorly made may. Don't risk your castings by using chaplets from an uncertain source. Insist on having FANNER, the perfect chaplet.

The Fanner Mfg. Co.

Brookside Park

CLEVELAND, OHIO

Stove Trimmings, Stove Scrapers, Stove Rods, Stove Bolts.

Quality first-class and prompt shipment guaranteed. Catalogue and prices furnished on application.

BURDICK & SON

Manufacturers of

Patent Stove Dovetails, Hinge Tubes, Door Catches, and Cover Lips, Core Chaplets, Screw Shells, etc., etc.

Send for Samples and Prices to Albany, N. Y.

UNITED STATES CHAPLET CO.

FOUNDRY SUPPLIES

95 LIBERTY ST. NEW YORK

Any style or size.

CHAPLETS
RIDDLES BRUSHES
LADLES

THESE ARE OUR SPECIALTIES

ASK FOR PRICES

Bristol's Recording Thermometers

for CORE OVENS will pay for themselves. Send for catalog 'O'.

The Bristol Co.

Waterbury, Conn.

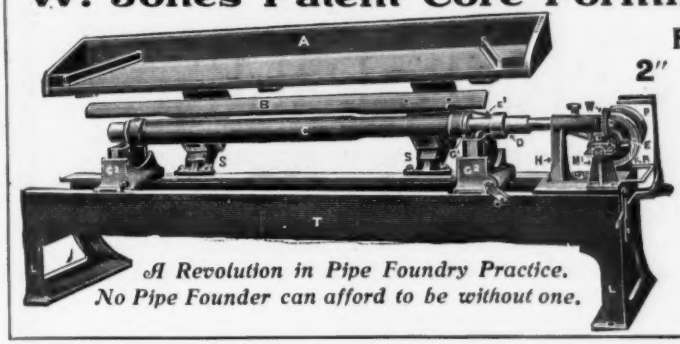
S. H. CAUFMAN

Foundry Supplies

Sieves, Shovels, Chaplets, Facings, Etc.

Write for Prices. **CHESTER, PA**

W. Jones Patent Core Forming Machine



A Revolution in Pipe Foundry Practice.
No Pipe Founder can afford to be without one.

For Pipe Cores 2″ to 20″ diameter.

MANUFACTURED BY

Jones & Attwood

STOURBRIDGE,

ENGLAND.

JEL-O-LUSE

Makes cores with either burnt, waste sand or new.
Rids the foundry of smoke, odor and gas.
Saves castings. Saves lungs.
Saves time in cleaning cores from castings.
Superior results with economy covered.

A long list of most reliable firms daily put Jeloluse to practical use proving its SUPERIORITY AND DESIRABILITY.

Evidence of above facts await you.
Goods put up in bbls. of 250 and 175 pounds BUT, as few pounds as desired furnished as trial order.

NAT'L JELOLUSE CO., 547 West 43rd St. NEW YORK.

N. B. We can meet competition in furnishing a good core flour where same is desired.

£ Oil is the base of all successful core compounds. In

STERLING CORE OIL

is found the most economical material for making good free venting cores.

STERLING OIL CO., **Emlenton, Pa.**

WAX WIRE FOR CORE VENT

The most perfect and cheapest Core Vent ever devised. Leaves the Vent Hole clear, clean and unobstructed. Perfectly flexible under all temperatures. Sizes from No. 20 to No. 0000 Stubbs gauge. In one pound coils of continuous lengths. Cost from one fifth of a cent per lineal foot and upwards. Samples sent on application.

Alfred Field & Co., 93 Chambers Street, New York City.

The Foundrymen's Primer

BY WALTER WANGELIN.

Price $1.00

In this little book a practical man, who has had many years' experience as a foundry chemist, describes the different classes of iron and tells how to mix metal, to figure analyses, etc. It is an exceedingly useful little book of 64 pages, bound in paper.

For sale by

The Foundry

CLEVELAND

Ajax "Bull" Babbitt

A SUPERIOR BRAND OF BABBITT METAL AT LOW COST.

This metal is designed for general purposes, and answers in 99 cases out of 100 where genuine babbitt is being used.

A babbitt costing only one half as much as genuine, and in most cases will do better service.

Can be used for all bearings excepting those carrying extremely heavy load.

Will run cool at any speed.

Compressive strength 12,100 lbs. per sq. in. to yield point.

Send for catalogue, giving tests in comparison with genuine babbitt. Inquiries solicited.

THE AJAX METAL COMPANY

Main Office and Works, Philadelphia, Pa
Branch Plant, Birmingham, Ala.

The Crescent Phosphorized Metal Co.

415 to 421 N. 22nd St.
PHILADELPHIA, PA.

Manufacturers of High Grade

Phosphor Tin Phosphor Bronze
Phosphor Copper Manganese Copper

DEALERS IN PHOSPHORUS
Lowest Market Prices

Manganese Ore,
Any Quality In Any Shape

Ferro-Manganese, 80%
Ground, Grain, Lump

Manganese Copper, 30%
Metallic Manganese and Cadmium

KENDALL & FLICK
Washington, D. C.

REG. TRADE MARKS
"Phosphor Bronze"
DELTA

THE PHOSPHOR BRONZE SMELTING CO. LIMITED,
2200 WASHINGTON AVE., PHILADELPHIA.
"ELEPHANT BRAND PHOSPHOR-BRONZE"
INGOTS, CASTINGS, WIRE, RODS, SHEETS, ETC.
— DELTA METAL —
CASTINGS, STAMPINGS AND FORGINGS
ORIGINAL AND SOLE MAKERS IN THE U.S.

ROYAL BRAND

Guaranteed

5% PHOSPHOR TIN and 10% PHOSPHOR COPPER 15%

These alloys have been tested by the most eminent Chemists, in the largest manufacturing establishments of the Country, and were pronounced to be the best materials of their kind in the market, and that they are all that they are claimed to be. They are absolutely the best deoxidizers known, and are **always uniform, always ready,** and easy to apply, and astonishing in the results produced. Write for sample, and be convinced.

R. F. LANG

Manufacturers Agent

2, 4 and 6 Old Slip, NEW YORK

ELECTROLYTIC FERRO-SILICON

HIGH GRADE

25%, 50%, 75%

We solicit your inquiries when in the market, both for spot and to arrive.

THE ROESSLER & HASSLACHER CHEMICAL CO.

100 William St., New York

Iron and Steel Makers,

Look Here!

BLACKWELL'S LION BRAND SAM ALLOY

Removes absolutely all flaws and blow-holes in iron and steel castings.

Superior to aluminum at considerable less cost.

THE PREMIER DEOXIDIZER

plumbago for facings and all foundry purposes. Fluor Spar for flux. Talc Pencils, etc.

GEO. C. BLACKWELL, SONS & CO., Limited, THE ALBANY, LIVERPOOL, ENG.

MANUFACTURERS, METALLURGISTS, MINE OWNERS, MERCHANTS

WORKS: Garston Docks. CODES: A. B. C., Moreing & Neal, Leibers, and Western Union. U.S.A. Agents, Pennsylvania Salt Co., Pittsburg, Pa.

THE NEW ERA M'F'G. CO. SPECIAL METALS ALLOYS KALAMAZOO, MICH. U.S.A.

Metallic Phosphoro

(Phosphor Tin Improved)

NICKELUMEN WHITE BRONZE

An ideal pattern metal. It is king of Bearing Metals, and can be poured into bearings the same as babbitt.

NEW ERA SOLUBLE METAL

(Boiler Compound)

ALUMINIZED ZINC AND BABBITT METALS

MACHINE AND CONVEYOR FOUNDRIES A SPECIALTY
G. K. HOOPER
PRODUCTION IMPROVED AND INCREASED IN GOING PLANTS

DESIGNER OF
CONSULTING ENGINEER
11 BROADWAY, NEW YORK
FOUNDRIES

DODGE & DAY, Engineers
MECHANICAL ELECTRICAL ARCHITECTURAL
Layout, Design and Supervision of Foundry Building Construction and Equipping
Philadelphia, - Pennsylvania

C. B. MURRAY, President — S. T. FISHER, Vice Pres. — GEO. P. MAURY, Sec'y & Treas.
The Metallurgical Laboratory
Analytical Chemists — Bureau of Inspection
Chemical and Mining Engineers
Particular attention given to analysis of pig iron and foundry supplies.
Bailey-Farrell Bldg., Pittsburg Pa.

HYDROFLUORIC ACID
for Cleaning Castings
General Chemical Co.
Moro Phillips Works

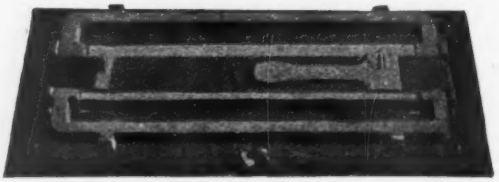
PHOSPHORUS
for Phosphor Metals
608 Bourse
Philadelphia, Pa.

BUYERS ON THE PACIFIC COAST
will find
Gautier's Black Lead Crucibles
in stock with
FAIR, TAYLOR & CO., Successor to S. R. Church, 604 Montgomery St. - Dealers in Foundry Supplies. San Francisco, Cal.

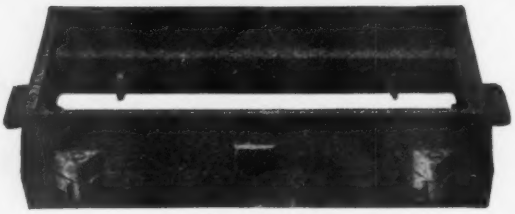
"KEEP'S TEST" OR MECHANICAL ANALYSIS

MECHANICAL ANALYSIS.

Taper steel scale which measures shrinkage.



Iron follow-board with yokes and brass patterns for test bars ½" □ × 12" long.



Iron Flask.

3 cents and 15 minutes' time each day saves hundreds of dollars.

Regulates quality of castings.

Accurate in hands of any one.

Send for circulars to

W. J. KEEP,
DETROIT. - - MICH.

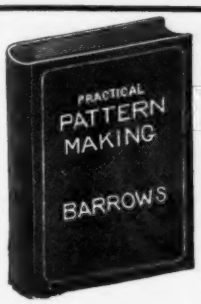
THE SURPLUS COKE CO.

Best Connellsville Brands

"The Coke of Quality"

Write for prices

1 Madison Ave. **NEW YORK CITY**



A new work on Pattern Making by a practical pattern maker.

Just Published

BY
F. W. BARROWS

Price $2.00

THIS is a very complete and practical treatise on the subject of pattern making, both in wood and metal. The book is made up of material gathered from the personal experince of the writer, and is full of useful hints and original ideas. The work is profusely illustrated with actual working drawings, and the explanations show how to avoid many difficulties which beset the path of the pattern maker.

Examples given in the latter part of the book include the making of patterns for pulleys, sheave wheels, chain-blocks, steam engine patterns, gear patterns, patterns for propeller wheels, globe valves and other examples.

For sale by
THE FOUNDRY, Cleveland

You will be Pleased

IF WE SELL YOU

Ceylon Plumbago

Indian Silver Lead

Graphite, Talc

Sea Coal

Ferro-Manganese

Ferro-Silicon

Or other Foundry Supplies

Ask us for prices and we will show you.

WESTERN FOUNDRY SUPPLY CO.

East St. Louis, Illinois

CRESCENT LEATHER FILLET

Standard of Quality

Our prices will interest you

The Cleveland Fillet Company

CLEVELAND, OHIO

YOUR MOLDERS SHOULD BE AS WELL EQUIPPED WITH TOOLS AS YOUR FOUNDRY

HELP THEM SECURE OURS

WILLIAM DOBSON
MAKER OF MOLDERS' TOOLS.

ELM AND SPENCER STS., CANASTOTA, N.Y.

RHODE ISLAND LEAD FACINGS

MOORE'S FACING WORKS

Send for Samples Original Manufacturers **Providence, R. I.**

AIR COMPRESSORS

Pneumatic Chipping Hammers, Hoists, Casting Cleaners, Sand Blast Machines, Molding Machines and other appliances in foundry work. Send for catalogue.

American Air Compressor Works, 26 Cortlandt St. NEW YORK

Books of Interest to Foundrymen

FOUNDRY CHEMISTRY.

BY FRANK L. CROBAUGH.

Price $2.00.

As a practical chemist, making a specialty of analyses for furnaces and foundries, Mr. Crobaugh has come in contact with the questions confronting the founder, when the latter attempts to obtain greater uniformity in his castings through the aid of chemistry. It has been the aim of the author to so prepare his book that it will assist the foundryman in using the information handed him by the chemist.

AMERICAN FOUNDRY PRACTICE.

BY THOS. D. WEST.

408 pages. Fully Illustrated. Price $2.50.

This is the first book written by Mr. West, and although the first edition appeared twenty years ago it is still considered a standard, constant revision having kept pace with the vast advances made in founding. Green Sand, Dry Sand, and Loam Molding are taken up in turn and methods for producing a casting at the least cost described.

The Foundry
Cleveland.

Brandau's Fire-Proof Molders' Shoes $2.50

So different from the ordinary, you will profit by knowing them. Reliable union made goods—pliable and easy to the feet—double covering to the exposed parts, and fireproof. This shoe is shapely and suitable for street wear but is particularly adapted to foundry use.

If your dealer does not carry them in stock, send $2.50 and I will send you a pair by Express or Mail, charges paid.

Send to-day, don't wait till you get burnt.

87 Sherman St. **DETROIT, MICH.**

Established 1856.

HENRY MAURER & SON,

Manufacturers of

HIGH GRADE FIRE BRICK,

420 East 23rd St., New York City, N.Y.

The labor setting 1000 fire brick is fully 70% of the cost of material, irrespective of quality; economy in the price of material is like "SAVING at the BUNG, to waste at the SPIGOT!"

THE

DRESDEN SAND COMPANY

Dresden, Ohio

MINERS AND SHIPPERS OF ALL GRADES OF

MOULDING

SAND

Good moulds are the basis of good castings—Dresden sand the basis of good moulds.

Harbison-Walker Refractories Co.

PITTSBURG, PA.

MANUFACTURERS OF HIGHEST GRADE REFRACTORY MATERIALS.

Fire Clay Silica **BRICK** **Magnesia Chrome**

Sole Agents for Carl Spaeter Magnesite. Importers of Chrome Ore.

Write for Booklet "F"

7,000 Regular Customers **1,100,000 Daily Capacity**

Bell Phone Keystone Phone

Edward J. Etting

Equipment for Brass, Grey Iron, Malleable and Steel Foundries.
Machine Shops, Railroad Shops, Rolling Mills and Tube Mills.
Cupola Linings, Foundry Facings and Supplies.
"Pridmore" Molding Machines. "Dings" Electro-Magnetic Separators.

Harrison Building, **PHILADELPHIA, PA.**

DIRECTORY OF LEADING PIG IRON DEALERS

MATTHEW ADDY & CO.,
CINCINNATI, ST. LOUIS,
PHILADELPHIA.
AGENCIES:
Chicago, Detroit, New York, Pittsburg.

DECAMP BROS. & YULE
IRON, COAL AND COKE CO.
SOLE AGENTS
The St. Louis Blast Furnace Co.'s Missouri
Malleable Bessemer and Basic Chill Pig Iron
Chicago Office
1103 Fisher Bldg.
MISSOURI TRUST BUILDING
ST. LOUIS

N. S. BARTLETT & CO.
PIG IRON, COAL, COKE
126 State Street, BOSTON, MASS.
Harrison Bldg., PHILADELPHIA, PA.

J. K. DIMMICK & COMPANY
PIG IRON, STEEL, COKE
2022-2023-2024 New Land Title Bldg.
PHILADELPHIA
401 Ellicott Square, BUFFALO

The
Foundryman's
Favorite

BUCKEYE
PIG IRON

BASIC
FOUNDRY
MALLEABLE
BESSEMER
Capacity 500 Tons Daily

THE
COLUMBUS IRON & STEEL CO.
COLUMBUS, OHIO

THE DOMHOFF & JOYCE CO.
PIG IRON
AND COKE,
CINCINNATI, - - - OHIO.

F. A. GOODRICH & CO.
INCORPORATED
PIG IRON, STEEL, COKE, &c.
DETROIT, - - MICH.

J. H. HILLMAN & SON,
PIG IRON,
STEEL AND COKE.
Charcoal, Pig Iron and 72 Hour Foundry Coke a Specialty.
FRICK BUILDING, - PITTSBURG, PA.

DALTON, NASH & CO.
PIG IRON and COKE
AGENTS FOR
Low Moor, Swede, Trussville, Woodward, Franklin Pig Iron and Hostetter Coke.
82 to 92 BEAVER ST., - NEW YORK

McKEEFREY & COMPANY
Pig Iron, Coal and Connellsville Coke.
LEETONIA, - - OHIO.

J. J. MOHR,
Pig Iron, Coke, Coal and Ores
BULLITT BUILDING, PHILADELPHIA, PA.

DIRECTORY OF LEADING PIG IRON DEALERS—Continued

PICKANDS, BROWN & CO.
Manufacturers, Importers and Dealers in
PIG IRON, COKE and IRON ORE
CHICAGO.

THE THOMAS FURNACE CO.
MILWAUKEE, WIS.
STRONG FOUNDRY IRON
FOR QUICK SHIPMENT

PICKANDS, MATHER & CO.,
PIG IRON,
IRON ORE, COAL and COKE.
CLEVELAND, OHIO.

WALTER-WALLINGFORD & CO.
SUCCESSORS TO
Thomas A. Mack & Co.
PIG IRON & COKE
1412-13 Traction Bldg., CINCINNATI
Farmers Bank Bldg., PITTSBURGH

PILLING & CRANE,
Pig Iron and Coke.
PITTSBURG PHILADELPHIA
NEW YORK BOSTON

F. B. STEVENS
FOUNDRY SUPPLIES
Connellsville Coke for quick shipment
DETROIT MICH.

ROGERS, BROWN & CO.,
CINCINNATI, CHICAGO, BUFFALO,
PHILADELPHIA, - - CLEVELAND,
NEW YORK, - - - BOSTON,
ST. LOUIS, - - - SAN FRANCISCO,
PITTSBURG, - - BIRMINGHAM.

SOLVAY COKE
For Foundry, Furnace and Domestic Use.
Ovens at Detroit
BAIRD & WEST, Sole Selling Agents
Detroit, Mich.

ROBERT FIELD SALES AGENCY
Sloss, Florence, Lady Ensley, Sheffield
FOUNDRY PIG IRON
1101-2-3 Traction Bldg. CINCINNATI, OHIO

We sell money-saving books on
FOUNDRY PRACTICE
Send for booklet.
The Foundry - - Cleveland, O.

ELLIOTT, DEBEVOISE & ANDERSON
PIG IRON, COKE, COAL
Foundry and Malleable Bessemer Pig Iron,
Special Low Sulphur Foundry and Furnace Coke
Agents for "Camden" Metallurgical Fdy., Fce., and Heating Coke.
95 LIBERTY ST., - NEW YORK CITY

CHAS. G. SHEPARD, PIG IRON
401 ELLICOTT SQUARE, BUFFALO, N.Y. & COKE.

FOUNDRY FABLES
No. 3

The FABLE *of the* EDUCATED SON *and his* FLIRTATION *with* OPPORTUNITY : : :

A FOUNDRYMAN had a Smart Son, who, people said, Took After his Father. Father thought that if he was to Shine by Reflected Light he wanted a Reflector proper, so Son was shipped to College where Modern Educators with Bulging Brows could fill him up with a lot of Stuff of Real Value in After Life. ¶ In four years the Sum of the Bright Round Bucks which Father had dished out was educator enough for him as to the Value of what Son Had Accumulated. It was back to the Bread Works for Son to earn Interest on the Investment and forget Some of his expensive Line of Habits which would make a Turkey Red Check Book turn pale. ¶ He shed the Habiliments of Learning and became the Man in the Overalls. Of his technical Learning, more Later. ¶ He Stood In with the Boss and was finally allowed to lick Stamps and copy Letters. He did right well. He was also a good waiter. Father didn't believe in littering up the yard with more than Two Kinds of Iron and when he couldn't make light stove castings, medium pulleys to be machined and cast balance weights from a Mixture of these Two, something was to blame—never Father's Judgment. Son saw this demonstrated frequently with a Signal Lack both of success and in meeting the Demands customers Make on a general jobbing foundry. ¶ Son had heard of Opportunity and decided that if he ever Met the Lady she would be the Honey Bun for Him. His for a wild flirtation. He copied letters and Waited. ¶ Finally it got to a Point where the iron was Sluggish, the castings were Full of Holes and the Repartee in the machine shop was not Polite. There was an Unhappy Feeling about the place. The office cat was affected and Thoughtfully Withdrew from further Contact with Boot Toes. ¶ At last Father said he'd be Tunk-Wizzled if he knew what the Matter Was and Doc began to Treat him for brain fever and told him to Forget Everything. Opportunity was giving son the Torrid Glance and they began Talking over the Back Fence. ¶ Son had figured that to make 'steen Different Kinds of Castings you had to Mix up a Prescription for each One and you couldn't any more do it with only two irons than a drug clerk could Cook up a Cough Syrup and a hair dye from carbolic acid and ipecac. ¶ He Wanted his assortment quick—before Father could Recover and Mix In. He straightway telegraphed to the Biggest House with their Fifty Different Brands of every Possible Kind for every Possible Purpose. The next day the Traveling Representative, Opportunity and Son held a joyous meeting. ¶ At the end of a week with a Northern Foundry, a Southern Foundry, a High Phosphorus Liquidizer, a High Silicon Silvery and a High Manganese Virginia iron on Tap, Son was tackling everything from light hardware specialties to bed plates with neatness and dispatch and using a Larger percentage of scrap than ever Before. ¶ At the end of the First Month he showed Father a larger Percentage of Profit and a smaller Percentage of Lost castings than the firm had any record. This Beat Medicine all Hollow and Father appeared at the Foundry in three days, ---and The Cat Came Back.

MORAL :—*Success cannot be Bought at the Bargain Counter.*

PIG IRON AND COKE

We represent 50 brands of PIG IRON produced in thirteen different states.

Also

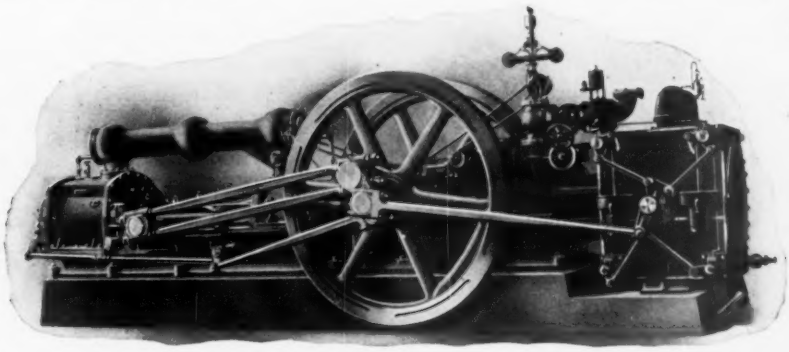
30 brands of 72-hour foundry and furnace COKE. Connellsville, Virginia, Pocahontas, New River, West Virginia, Tennessee and Kentucky Districts.

Rogers, Brown & Co.,

Cincinnati Philadelphia New York Cleveland Chicago Boston Buffalo Pittsburg St. Louis Birmingham

You need 100 lbs. air pressure for effective work with the air hammer; you need only about 20 lbs. for the air blast.

What is the sense of compressing all the air to 100 pounds and throttling down or using a pressure reducer for the sand blast, or installing two air compressors?



Take the two pressures from the same compressor, in exactly the quantity needed for the varying demands of each pressure.

Save power. Make your compressor more available and effective for each use.

Be ahead of the procession and use the very latest improved machinery.

The AUTOMATIC SKIP VALVE now being introduced by the Norwalk Iron Works Company does the work. Will tell you more about it for the asking.

THE NORWALK IRON WORKS COMPANY,
SOUTH NORWALK, CONN.

THE DEANE PNEUMATIC SAND SIFTER

An entirely new design of pneumatic or steam shaker for sifting sand wherever compressed air or steam power is available.

The air cylinder is an ingenious application of the engine of the Deane steam pump.

Apparatus is absolutely reliable under all conditions.

The Deane sifter is in every way much superior in construction to any other similar device on the market.

Apparatus is designed to withstand long and hard usage. There is great power with small consumption of air or steam.

Send for Circular.

The Deane Steam Pump Co.
Holyoke, Mass., U. S. A.

WHAT THEY SAY ABOUT CONNERSVILLE BLOWERS

INTERNATIONAL HARVESTER COMPANY

GENERAL OFFICES AT CHICAGO, U. S. A.

DEERING WORKS
16 Pollasky Ave.

CHICAGO, ILL., Mch. 30, 1906.

Connersville Blower Company,
Connersville, Indiana.
Gentlemen:

Replying to yours of March 16th in regard to Blower which we purchased from you a number of years ago, we beg to advise that we still have this machine in operation giving satisfactory results.

Yours very truly,

INTERNATIONAL HARVESTER COMPANY
DEERING WORKS
By J. Kattau
Assistant Superintendent.

THE DAYTON GLOBE IRON WORKS COMPANY

the New American TURBINE Water Wheel

Dayton, Ohio, U.S.A., March 27, 1906.

Address all communications to the Company.

Connersville Blower Co.,
Connersville, Ind.
Gentlemen:

In reply to your esteemed favor of the 26th inst., beg to state that we installed one of your 24 cubic feet positive pressure foundry blowers several years ago and it has given us the very best of satisfaction. We have had it in use practically every afternoon since it was installed, and do not think we have been caused any trouble or expense whatever by it.

Yours very truly,
THE DAYTON GLOBE IRON WORKS CO.,
R R Dudley Jr
President.

RRD-m

PURCHASING DEPARTMENT

ADVANCE THRESHER CO.

BATTLE CREEK, MICH. March 15, 1906.

Connersville Blower Co.,
Connersville, Ind.
Gentlemen:

Yours of the 13th asking for information as to how the pressure blower that we bought of you three years ago last summer is working is received. Will say that this blower was put in our new Foundry which was started in operation in November 1902. We are glad to say that the blower has never given us one particle of trouble and we see no reason why it is not now as good as when we got it. We operate this blower with a 40 HP. motor and can say that if the machinery in the other departments of our factory operate as well as this equipment has we certainly would be well satisfied.

Yours very truly,
ADVANCE THRESHER CO.
M. DeYoung

The Gem City Stove Co.

Dayton Ohio USA Mch. 27, 06

The Connersville Blower Co.
Connersville, Ind.
Gentlemen:-

We have been using one of your #6 Cycloidal Blowers for the past ten years, and it has always given the very best of satisfaction.

It is as good to-day, as when we first got it. We have never had it repaired.

Yours very truly
The Gem City Stove Co.,
H. L. [illegible] Pres.

The Craig Ridgway & Son Company
Steam Hydraulic Machinery

ELEVATORS AND CRANES
OILGOVERNED AIR HOISTS
PERFECTION WATER WHEELS
CASTINGS AND MACHINERY

Coatesville, Pa. April 18 1906

The Connersville Blower Co.
Connersville, Ind.
Dear Sirs:-

We have had one of your blowers direct connected to Steam Engine which has been in constant service every day for about 5 years and in all that time we have never been called upon to give it any further attention than oiling.

It has certainly been a most satisfactory machine in every way.

Yours with regards
CRAIG RIDGWAY & SON CO.,
Wm H. Ridgway

WHAT

INTERNATIONAL HARVESTER COMPANY

GENERAL OFFICES AT CHICAGO, U. S. A.

CHAMPION DEERING MCCORMICK MILWAUKEE PLANO

THEY